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NUCLEAR SCIENCE ABSTRACTS

Volume 10 October 15, 1956 No. 19 Suppl.

BIOLOGY AND MEDICINE

TOXICOLOGY STUDIES

8757 CH-3875
Chicago. Univ. Metallurgical Lab.
ACUTE TOXICITY OF INTUBATED PLUTONIUM.
Richard Abrams, Henri C. Seibert, Lyman Forker, David Greenberg, Hermann Lisco, Leon O. Jacobson, and Eric L. Simmons. June 1946. Decl. Dec. 20, 1955. 56p. Contract W-7401-eng-37. $0.30(OTS).

Pu in the 4^+ state and in the absence of complexing agents was administered to the lungs of rats by tracheal intubation. Five groups of animals received doses ranging from 7.5 to 500 μg per 200 gram rat. All of these doses were lethal, the mean survival time ranging from 203 days for the lowest dose to 26 days for the highest. Inhalation is the most dangerous route of administration, the 150-day LD_{50} being only 0.1 that of intravenous injection. Once in the lung, Pu seemed to be tightly bound. Even after 210 days, 25% of the initial dose was still in the lung. This may have been due to inflammation and congestion. Approximately 15% of the initial dose was deposited in the skeleton. (auth)

Refer also to abstract 8781.

CHEMISTRY

8758 AECD-3968
Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.
CATALYTIC RECOMBINATION OF HYDROGEN AND OXYGEN—II. J. V. Gaven, R. B. Bacastow, and A. C. Herrington. Aug. 29, 1952. Decl. Dec. 23, 1955. 35p. (KT-134). $0.30(OTS).

A study of the reaction rate of stoichiometric mixtures of H and O on a platinized alumina bed is reported. Data are presented graphically, and factors affecting the reaction rate are discussed. (C.H.)

8759 CF-53-8-30
Oak Ridge National Lab., Tenn.
ENTHALPY AND HEAT CAPACITY OF LITHIUM CHLORIDE, POTASSIUM CHLORIDE EUTECTIC. W. D. Powers and G. C. Blalock. Aug. 5, 1953. 3p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

ANALYTICAL PROCEDURES

8760 AECD-4161
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE DETERMINATION OF TUBALLOY [URANIUM] IN THE PRESENCE OF THORIUM IN PEROXIDE EFFLUENTS AND CAKES. W. R. Lasko and C. D. Susano. Feb. 1, 1946. Decl. Feb. 15, 1956. 9p. Contract W-7401-eng-23. (C-3.360.9) $1.80(ph OTS); $1.80(mf OTS).

A polarographic method for the determination of U in thorium peroxide cakes in an acid medium was found to give satisfactory results. Fluorescent analyses on effluents containing Th gave good results if the Th content was kept below 1 mg/liter. (auth)

8761 AECD-4171
Los Alamos Scientific Lab., N. Mex.
DETERMINATION OF CHROMIUM IN PLUTONIUM. Maynard E. Smith. April 1955. Decl. with deletions Dec. 12, 1955. 27p. Contract W-7405-eng-36. $0.25(OTS).

A method for the determination of Cr in Pu is described and evaluated. The Cr is oxidized to chromate in basic solution with H_2O_2. The excess peroxide is decomposed by heating and the solution is made up to volume without removing the Pu precipitate. The Cr is then determined in the supernatant either by measuring the absorbance of the chromate ion or by using diphenylcarbazide as a colorimetric reagnet. As little as 10 ppm of Cr may be determined by the method described. Standard deviations of 7 to 1 relative % were obtained for Cr concentrations of 40 ppm to 1% respectively. Thorium and small amounts of Fe and U do not interfere with the procedure. (auth)

8762 AECD-4174
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE ANALYSIS OF IMPURITIES IN VARIOUS STAGES OF RECYCLED CARBON TETRACHLORIDE AND CORRELATION WITH CHLORINATION PROPERTIES.
R. L. Hudson, L. E. Burkhart, and C. E. Larson. May 23, 1946. Decl. Feb. 13, 1956. 12p. Contract W-7401-eng-23. (C-0.350.18). $3.30(ph OTS); $2.40(mf OTS).

When recycling of CCl_4 was suggested as a Beta plant procedure it was thought advisable to check it at various stages of the proposed purification process. Appropriate samples were obtained and the chlorination reactions were run and the products analyzed. The results showed a consistent decrease in the quality of the product in going from new, distilled, caustic wash and used CCl_4. The same samples were then submitted for analysis by infrared absorption spectra. The impurities present were discovered to arise from the use of Celvacene lubricant. The main impurity, which was found in all of the recycle stages, was found to be an aldehyde. This impurity was proven to inhibit the reaction and its presence may be correlated with the chlorination properties of the recycled CCl_4. (auth)

8763 AECD-4180
Tennessee Eastman Corp., Oak Ridge, Tenn.
COLORIMETRIC ANALYSIS FOR CADMIUM—DIPHENYLTHIOCARBAZONE (DITHIZONE) METHOD.
W. B. Schaap, H. Farber, L. J. Andrews, and J. W. Gates, Jr. Aug. 17, 1945. Decl. Feb. 15, 1956. 7p. Contract W-7401-eng-23. (C-1.360.3). $1.80(ph OTS); $1.80(mf OTS).

The well known colorimetric method for determining Cd by means of dithizone was reinvestigated and found applicable to solutions containing interfering ions such as are found in the plant. Copper, however, must be removed prior to using this analytical procedure. (auth)

8764 AECD-4186
Tennessee Eastman Corp., Oak Ridge, Tenn.
SPECTROGRAPHIC DETERMINATION OF VANADIUM IN [UF_4] TF_4. Alfred B. Chandler, L. E. Burkhart, and J. W. Gates, Jr. Sept. 22, 1945. Decl. Jan. 27, 1956. 5p. Con-

tract W-7401-eng-23. (C-1.360.4). $1.80(ph OTS); $1.80 (mf OTS).

A method of direct analysis of UF_4 to eliminate the time factor and any error introduced by conversion of UF_4 to U_3F_8, is reported. All available methods of excitation were investigated. (auth)

8765 AECD-4189
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE DETECTION OF URANIUM BY X-RAY SPECTROMETRY. B. G. Saunders, L. E. Burkhart, and C. E. Larson. Apr. 9, 1946. Decl. Feb. 15, 1956. 22p. Contract W-7401-eng-23. (C-0.360.6). $4.80(ph OTS); $2.70(mf OTS).

The possibility of detecting small quantities of U with an x-ray spectrometer was investigated. An x-ray spectrograph was modified by substituting a Geiger counter for the photographic film. Both primary and secondary methods of excitation were studied. Radiation background of high intensity and variability limits the sensitivity of the present apparatus to 1%. Suggestions are made for increasing the sensitivity of the method. (auth)

8766 AECD-4234
Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.
ANALYSIS OF URANIUM HEXAFLUORIDE-HYDROGEN FLUORIDE SOLUTIONS BY FREEZING POINT DETERMINATION. ERRORS CAUSED BY LIQUID-VAPOR EQUILIBRIUM. Wallace Davis, Jr. and E. H. Kobisk. Apr. 5, 1955. Decl. Feb. 9, 1956. 12p. Contract [W-7405-eng-26]. (KLI-3438). $3.30(ph OTS); $2.40(mf OTS).

Calculations were made on the effect of concentration of HF in the vapor phase over UF_6-HF solutions at their freezing points. In the absence of experimental values of the association factors of HF in the vapor phase, it is only possible to calculate a range of the gross composition of material in a freezing point cell when the freezing point of the solution and the vapor-to-liquid volume ratio are known. However, errors in estimation of gross composition due to the absence of data on HF association are considerably smaller than errors that can be associated with neglecting the HF in the vapor phase. (auth)

8767 HW-23080
[Hanford Works, Richland, Wash.]
DENSITOMETRIC DETERMINATION OF IRON IN PLUTONIUM. J. L. Daniel. Dec. 20, 1951. Decl. Feb. 20, 1956. 9p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80 (mf OTS).

Work performed in the establishment of an improved spectrographic method for determining Fe in Pu is summarized. (auth)

8768 HW-27229
[Hanford Works], Richland, Wash.
HANFORD WORKS ANALYTICAL MANUAL FOR REACTOR PROCESS WATER. Feb. 13, 1953. Changed from OFFICIAL USE ONLY Feb. 20, 1956. 75p. Contract [W-31-109-Eng-52]. $12.30(ph OTS); $4.50(mf OTS).

The analytical methods to be applied for control purposes in the Hanford reactor laboratories are specified. The procedures are in general form to be used as reference rather than outlined laboratory instructions. (D.E.B.)

8769 HW-29820
Hanford Atomic Products Operation, Richland, Wash.
ELASTIC ANALYSIS OF STRESS CONDITIONS IN A REDUCTION BOMB (TASK III REPLACEMENT PRESSURE VESSEL MODEL-1302). Kenneth R. Merckx. Feb. 19, 1954. Decl. Feb. 1, 1956. 6p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

An estimate of an equivalent tensile stress that approximates the worst stress condition existing in a Pu reduction bomb was made. It was found that only hoop and compressive stresses need to be considered. (F.S.)

8770 HW-31911
Hanford Atomic Products Operation, Richland, Wash.
SPECTROCHEMICAL DETERMINATION OF U-235 IN U-238. J. L. Daniel. May 21, 1954. Decl. Feb. 20, 1956. 4p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80 (mf OTS).

Investigation of the use of the spectrograph for the determination of low concentrations of U^{235} in a matrix of U^{238} has been made in the Hanford laboratory. Two analytical methods have been studied in detail, using a Jarrell-Ash 3.4 meter spectrograph. These two methods lead to about the same precision of analysis, the standard deviation being between ±5 and ±10% of the amount present for a single determination. Hanford requirements are such that a precision of ±1% is highly desirable. As far as is known, a spectrochemical method meeting these requirements has never been developed. It is expected that use of a Quantometer will result in improvement in the precision attainable by either of the two methods outlined, or by some other method which might result from these Quantometer studies. (auth)

8771 HW-32386
Hanford Atomic Products Operation, Richland, Wash.
THE USE OF POTASSIUM THIOCYANATE, -CITRATE, AND -OXALATE COMPLEXING MIXTURE FOR SODIUM HYDROXIDE TITRATION OF LOW LEVEL NITRIC ACID IN URANIUM SOLUTIONS: A COMPARISON OF SODIUM HYDROXIDE TITRATION AND COULOMETRIC TITRATION. A. C. Leaf and E. W. Christopherson. July 6, 1954. 6p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Acid titration based upon uranium complexing with potassium oxalate is not satisfactory when applied to solutions of arbitrarily high uranium/nitric acid ratio. Investigations show the titrant in the coulometric method for nitric acid determination may be replaced with a titrant of tenth normal NaK in 50 volume % isopropanol. Comparable accuracy and precision result when ten times as much sample is used as is required for coulometric acid determination. TBP and hydrocarbon diluents do not offer significant interference. Present and anticipated plant streams are not expected to cause unusual personal exposure in securing accuracy and precision presently required by research and manufacturing. (F.S.)

8772 HW-37935
Hanford Atomic Products Operation, Richland, Wash.
AN EVALUATION OF MONITORING METHODS FOR NO AND NO_2. D. R. Kalkwarf. May 16, 1955. 15p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40(mf OTS).

A survey is reported of methods for determining trace amounts of NO and NO_2 in air. Methods are evaluated in relation to their applicability to continuous monitoring procedures for these substances in stack gas and in air for human consumption. (F.S.)

8773 KAPL-M-EES-1
Knolls Atomic Power Lab., Schenectady, N. Y.
THE SPECTROPHOTOMETRIC DETERMINATION OF SMALL QUANTITIES OF OILS AND GREASES. E. E. Swain, Jr., and F. K. Heumann. July 24, 1953. 14p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

Equipment which has been cleaned in a commercial degreaser often contains small quantities of oil and grease. Since some systems can tolerate only minute amounts of these materials, an analytical method was devised to detect

them. Spectrophotometric analysis has proved capable of detecting oils in concentrations as low as 0.001 mg oil/cm^2 surface area. Absorption in both the ultraviolet and infrared regions was investigated, but the latter proved the most satisfactory. (auth)

8774 KAPL-M-HAM-1
Knolls Atomic Power Lab., Schenectady, N. Y.
A POLAROGRAPHIC DETERMINATION OF IRON AND CHROMIUM. Harvey A. Mahlman. Dec. 19, 1949. Decl. Feb. 9, 1956. 17p. Contract W-31-109-Eng-52. $3.30 (ph OTS); $2.40(mf OTS).

Polarographic methods were determined to satisfy the demand for the analysis of Fe and Cr in solutions where the high level of radioactivity might prohibit safe handling by colorimetric or other methods. These methods have adaptability for the analysis of process streams, dissolved stainless steel, and since they are sensitive at low concentrations, the dissolved corrosion product of stainless steel. Accuracy within 5% is obtainable in both instances. (F.S.)

8775 KAPL-M-LRY-1
Knolls Atomic Power Lab., Schenectady, N. Y.
THE DETERMINATION OF RUTHENIUM IN URANIUM. Lawrence R. Yetter. Mar. 2, 1955. 8p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

Procedures for the determination of Ru in U are briefly outlined. (B.J.H.)

8776 LA-1176
Los Alamos Scientific Lab., N. Mex.
IMPROVED EQUIPMENT FOR POTENTIOMETRIC TITRATION PROCEDURE. Edward N. Wise. Sept. 11, 1950. Decl. Dec. 12, 1955. 48p. Contract W-7405-eng-36. $0.35 (OTS).

An automatic titrator has been designed and constructed which has been shown to be capable of assaying homogeneous samples of plutonium with an average precision of 0.7 to 0.9 parts per thousand, and routine samples of plutonium with an average precision of 1.2 parts per thousand. The samples of plutonium were converted to the sulfate and reduced to the +3 valence state with an excess of titanous sulfate before being transferred to the titrator. The titrator automatically added sulfatoceric acid from a motor-driven syringe, both continuously and incrementally, to accurately determine first the ceric-titanous endpoint and then the ceric-plutonium endpoint. The number of turns of the syringe-drive gear train between the two endpoints was indicated, from which the operator could calculate the quantity of plutonium in the sample, based on previous standardization runs. Samples of sodium oxalate and of iron were automatically titrated using both sulfatoceric acid and potassium permanganate as the oxidant. (auth)

8777 LA-1585
Los Alamos Scientific Lab., N. Mex.
A SPECTROPHOTOMETRIC METHOD FOR DETERMINING SMALL AMOUNTS OF BERYLLIUM IN URANIUM. Maynard E. Smith. Aug. 1953. Decl. Dec. 7, 1955. 26p. Contract W-7405-eng-36. $0.25(OTS).

A spectrophotometric method for the determination of Be in U is described. The estimated standard deviation is 0.035 ppm for samples containing as little as 0.10 ppm of Be and 0.080 ppm for samples containing as much as 5.00 ppm of Be. This reproducibility was obtained by using absorption cells with a 10-cm. light path for the lower concentrations of Be and cells with a 1-cm. light path for the higher concentrations. The method is based on the extraction of the beryllium acetylacetone complex from $U(CO_3)_3$ solutions. The light absorption of this complex in chloroform is measured at a wavelength of 295 mμ after the excess acetylacetone reagent has been removed by an alkaline extraction. The absorbance is a linear function of the Be concentration. The results of a survey of the sensitivity and reproducibility of several colorimetric methods for Be are also included. (auth)

8778 MITG-A44
Massachusetts Inst. of Tech., [Watertown, Mass. Mineral Engineering Lab.].
THE PRECIPITATION OF URANIUM BY INORGANIC ACIDS OF GROUPS V AND VI. Progress Report. Sara Bailey. Mar. 31, 1948. Decl. Apr. 11, 1956. 46p. Contract [W-7405-eng-85]. $0.30(OTS).

The two leaching processes most used for extracting U from the 396-5 ore are the simple leaching and the countercurrent leaching processes. In the simple leaching process, reagents and ore are treated together, continuously and concurrently. In addition to some ferric Fe obtained from the ore, Ferrisul and H_2SO_4 are added to obtain extraction of U. The pregnant solution is separated from the final residue, and it contains approximately 0.75 g/liter of ferric Fe, 0.75 g/liter of ferrous Fe, and 0.05 g/liter of U oxide (U_3O_8). The pH of the pregnant leach liquor is 2.0. In the countercurrent leaching process, the ore and reagents move in opposite directions. The most concentrated liquor is removed from the nearly leached ore, and the weakest liquor is applied to the fresh ore. The process is carried out in steps with Ferrisul, and H_2SO_4 is added to the last leaching step used on the ore. The pregnant solution contains 1.0 to 1.5 g/liter of ferrous Fe, minute amounts of ferric Fe, and about 0.05 g/liter of U_3O_8. The pH of the pregnant liquor is 3.5. Pregnant leach liquors from either process have been precipitated with MgO, CaO, NH_4OH, or NaOH. The precipitate obtained with MgO and CaO contains about 10% solids, and that obtained with other precipitants contains 1% solids. The dried cake analyzes 2 to 3% U oxide, except when CaO is used. Gypsum, formed from lime, dilutes the precipitate. The balance of the precipitate is mainly Fe, Mg, Ca, Al, and water. Recovery of U in the precipitate is 99%. The precipitate is bulky, cumbersome to handle, and hard to dewater. Because of the low grade and high water content of the precipitate, it was thought necessary to investigate other precipitants. (auth)

8779 MITG-A65
[Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.]
THE FLUORIMETRIC DETERMINATION OF URANIUM. PART I. THE APPLICATION OF THE PRICE-ARGONNE MODEL XI FLUORIMETER TO THE DETERMINATION OF URANIUM IN LOW-GRADE ORES. Urpo Koskela and David Kaufman. May 16, 1949. Decl. Apr. 11, 1956. 36p. Contract W-7405-eng-85. $0.25(OTS).

A rapid-control method for the fluorimetric determination of U in ores and ore products is presented. This method was developed for use with the Argonne Model XI fluorimeter. A description of the equipment and techniques used is given in detail. One analyst can make from 120 to 180 determinations per day with a standard deviation of 7% provided the samples are already in solution and are diluted to the proper concentration. (auth)

Refer also to abstract 8808.

FLUORINE AND FLUORINE COMPOUNDS

8780 A-1748
Iowa State Coll., Ames.
THE PREPARATION OF 2,2,2-TRIFLUOROETHANOL. Henry Gilman. Feb. 12, 1944. Decl. Feb. 7, 1956. 5p. $1.80(ph OTS); $1.80(mf OTS).

In the preparation of 2,2,2.-trifluoroethanol, trifluoroacetamide is hydrogenated in a high pressure bomb

with anhydrous ether using PtO_2 as a catalyst. Uranium pentatrifluoroethoxide is prepared in a reflux condenser in a NH_3 atmosphere by the action of trifluoroethanol and UC15 in a dry ether media. (W.L.H.)

8781 AECD-3776

[Madison Square Area, Manhattan District, New York.]
THE TOXICITY OF FLUORINE. J. L. Ferry. [nd]. Decl. Nov. 29, 1955. 15p. (M-4883). $3.30(ph OTS); $3.00(mf OTS).

The biological effects of fluorine and fluorine compounds on man and animals are presented. Also presented are the principle hazards of fluorine from the industrial standpoint. (W.L.H.)

8782 AECD-4230

Carbide and Carbon Chemicals Div. K-25 Plant, Oak Ridge, Tenn.
LITERATURE SURVEY FOR THE FLUORINE GENERATION PROGRAM. Sidney Katz. Dec. 7, 1951. Decl. Feb. 9, 1956. 28p. Contract [W-7405-eng-26]. (KLI-1219). $4.80(ph OTS); $2.70(mf OTS).

Three types of cells were actively considered for the production of F_2; high-, medium-, and low-temperature, with operating temperatures of 240, 100, and 30°C respectively. The medium-temperature cell was found to have fewer disadvantages. The design and operation of this cell are discussed, and the solutions to electrolyte and anode problems are given. (D.E.B.)

8783 CC-3386

California. Univ., Berkeley. Radiation Lab.
CONTINUOUS PRODUCTION OF TRIFLUOROTRICHLOROPROPENE. Peter Yankwich. Nov. 14, 1945. Decl. Jan. 18, 1956. 12p. Contract W-7405-Eng-48B. $3.30 (ph OTS); $2.40(mf OTS).

Heretofore the most expensive part of the synthesis of fluorinated diketones for extraction work has been the introduction of the F_2 into the molecule. Work has been completed on a process for the continuous fluorination of hexachloropropene, using anhydrous HF as the F_2 source and solid SbF_3 as catalyst. The process can produce the fluorinated olefin for less than $6.00 per pound. The apparatus and procedure is described. (auth)

GRAPHITE

8784 AECD-3912

United Carbon Products Co., Inc., Bay City, Mich.
PURIFICATION OF GRAPHITE. G. T. Sermon. June 16, 1948. Decl. Dec. 8, 1955. 26p. Contract AT-30-1-Gen-127. (UCP-1). $0.25(OTS).

Graphite designated as ACHT having an ash content of 600 ppm and a B content of 0.6 ppm was purified to where the total ash was <10 ppm and the B <0.10 ppm. The processing was carried out on batches of 800 to 900 lbs made up of blocks $4\frac{1}{8}$ in. × $4\frac{3}{8}$ in. × 26 in. Processing is done in an electric granular C resistance furnace capable of heating to 2400°C. The purification is achieved by reacting most of the compounds out by the use of CCl_4 with N introduced into the heated zone up to 2000°C; the removal of B is achieved by the use of a fluorinated hydrocarbon such as difluorodichloro-methane (i.e., Freon "F-12") at temperatures above 2000°C and up to 2400°C. The "F-12" is used only at the high-temperature level to avoid reformation of carbon tetrafluoride with the graphite being processed. The lowering of density of the bars treated is less than 0.10%, which is directly correlated to the amount of ash removed. Dimensions of the pieces treated are not affected. The plant facilities are capable of producing 900 lbs per day of high purity graphite, complete with a control analysis conducted in accordance with National bureau of Standards procedure. Other types of graphite have been successfully treated, such as AGOT, AGX, CS-121, ACR, etc. (auth)

8785 CP-1961

Chicago. Univ. Metallurgical Lab.
TEMPERATURE AND HEAT FLOW IN A GRAPHITE ELECTRODE. R. Schlegel. Aug. 3, 1944. Decl. Feb. 14, 1956. 8p. (A-2839). $1.80(ph OTS); $1.80(mf OTS).

The equations for describing heat flow and temperature variations along a long graphite electrode are developed. These variables are plotted as a function of temperature for electrodes in use at Hanford. (D.E.B.)

8786 M-4615

Brookhaven National Lab., Upton, N. Y.
GRAPHITE STRUCTURE TESTS (MONSTROSITY TESTS). R. W. Powell. Nov. 30, 1949. Decl. Jan. 10, 1956. 79p. Contract [AT-30-2-gen-16]. $13.80(ph OTS); $4.80(mf OTS).

Detailed data are presented from the analysis of graphite structures for mechanical strength under conditions closely resembling pile operation. (C.H.)

LABORATORIES AND EQUIPMENT

8787 HW-30556

[Hanford Atomic Products Operation, Richland, Wash.]
THE HANFORD REMOTE PIPETTER. K. H. Hammill. Jan. 15, 1954. Decl. Apr. 26, 1954. 17p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40(mf OTS).

A discussion and photographs of remotely operated pipetters used in Hanford laboratories are given. (D.E.B.)

RADIATION CHEMISTRY

8788 KAPL-M-LMD-1

Knolls Atomic Power Lab., Schenectady, N. Y.
A SURVEY OF SOME POSSIBLE RADIATION INDUCED REACTIONS FOR THE UTILIZATION OF THE RADIANT ENERGY IN FISSION PRODUCTS. L. M. Dorfman, W. S. Horton, and S. S. Jones. Apr. 7, 1952. 16p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

The radiation-induced reactions selected for investigation were the synthesis of hydrazine from ammonia; nitrogen fixation for the formation of NO_2; the oxidation of sulfur dioxide; the oxidation of ethylene; the bromination of pyridine; and the decarboxylation of fatty acids. These reactions may produce commercially feasible products and must compete with normal chemical production methods. (F.S.)

SEPARATION PROCEDURES

8789 AECD-4113

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.
SYSTEMATIC ION EXCHANGE STUDIES. George W. Lower. Feb. 28, 1951. Decl. Dec. 20, 1955. 25p. Contracts W-7405-eng-85; AT-1-30-Gen-211; and AT(49-1)-533. (MITG-A108). $0.25(OTS).

The adsorption of U and SO_4^{2-} from sulfate solutions by the anion exchange resin Amberlite IRA-400 in the chloride form has been studied using pure solutions. Strong bisulfate adsorption in addition to sulfate adsorption was found to occur in acid solutions. Uranium adsorption was found to increase with U concentration and with pH, and to decrease with increasing sulfate concentration.

Magnesium sulfate was found to retard U adsorption to a greater extent than sodium sulfate. Evidence was found which indicates that the U complex anion is of general form $UO_2(SO_4)_n^{2-2n}$. (auth)

8790 AECD-4130
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF DECEMBER 1947. E. J. Center, H. A. Pray, A. C. Richardson, and J. D. Sullivan. Dec. 31, 1947. Decl. Jan. 27, 1956. 12p. Contract W-38-094-eng-27. (BMI-JDS-18). $3.30 (ph OTS); $2.40(mf OTS).

Progress is reported on U ore dressing, pyrometallurgy, and phosphate chemistry. (D.E.B.)

8791 AECD-4131
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF NOVEMBER 1947. E. J. Center, H. A. Pray, A. C. Richardson, and J. D. Sullivan. Nov. 30, 1947. Decl. Jan. 30, 1956. 13p. Contract W-38-094-eng-27. (BMI-JDS-17). $3.30(ph OTS); $2.40(mf OTS).

Progress is reported on U ore dressing, pyrometallurgy, and phosphate leaching. (D.E.B.)

8792 AECD-4151
Tennessee Eastman Corp., Oak Ridge, Tenn.
SEPARATION OF TUBALLOY [URANIUM] FROM GUNK SOLUTIONS BY SULFITE PRECIPITATION. A. D. Ryon and E. C. Armstrong. Apr. 18, 1945. Decl. Feb. 14, 1956. 10p. Contract W-7401-eng-23. (CD-GS-36) $1.80(ph OTS); $1.80(mf OTS).

A method is presented for the precipitation of U, apparently as a uranyl ammonium sulfite, from gunk solutions containing the contaminants encountered in the recovery cycle. The impurities are not precipitated under the conditions employed, and their amounts in the product are reduced to values which can be attributed to occlusion. The recovery of U on one precipitation ranges from 99.5 to 99.9%. (auth)

8793 AECD-4159
Tennessee Eastman Corp., Oak Ridge, Tenn.
RECLAMATION OF CONTAMINATED DIFFUSION PUMP OIL AND REMOVAL OF TUBALLOY (URANIUM) THEREFROM. J. E. Lee, Jr., K. O. Hambrock, and C. D. Susano. Dec. 6, 1945. Decl. Feb. 15, 1955. 18p. Contract W-7401-eng-23. (C-3.320.3). $3.30(ph OTS); $2.40(mf OTS).

The U contamination in diffusion pump oils in the plant may be removed by vacuum distillation under the conditions described. In the process used, the U is concentrated in a small amount of residue. The distillate is reusable in the diffusion pumps, contains essentially no U, and represents 90 to 94% of the original volume processed. Distillations are practical at pressures from 2 to 0.1μ of Hg or better in 5-liter equipment incorporating, as the fractionating unit, an unpacked column 50 in. long, 1 in. in diameter, and externally heated by three sections of nichrome element windings. (auth)

8794 AECD-4160
Tennessee Eastman Corp., Oak Ridge, Tenn.
PROCESSING LEACH SOLUTIONS FROM PYROSULFATE FUSIONS OF SALVAGE RESIDUES FOR THE RECOVERY OF TUBALLOY [URANIUM]. A. D. Ryon, L. M. Aikin, and C. D. Susano. Jan. 25, 1946. Decl. Feb. 15, 1956. 7p. Contract W-7401-eng-23. (C-3.320.5) $1.80(ph OTS); $1.80(mf OTS).

Two methods are presented for the elimination of sulfate and second group interferences in the extraction of U from residues which have been processed by the pyrosulfate fusion method. Sulfate ion is precipitated and separated as $CuSO_4$ by saturating the leach solutions with $Cu(NO_3)_2$ before extraction with dibutyl carbitol. Uranium is separated from second group elements by precipitation with H_2S, and from sulfate by a double precipitation with NaOH prior to dibutyl carbitol extraction. (auth)

8795 AECD-4165
[Tennessee Eastman Corp., Oak Ridge, Tenn.]
FACTORS AFFECTING THE PRECIPITATION OF TUBANYL PEROXIDE FROM GUNK SOLUTIONS AT REDUCED TEMPERATURES. PART I. BETA. K. B. Brown, D. H. Swanson, E. L. Wagner, and A. J. Miller. Mar. 6, 1945. Decl. Feb. 14, 1956. 8p. (CD-4103). $1.80(ph OTS); $1.80(mf OTS).

A method for the separation of UO_4 by precipitation from gunk solutions where the reaction is not quantitative in the presence of Fe is outlined. (J.E.D.)

8796 AECD-4166
Tennessee Eastman Corp., Oak Ridge, Tenn.
DIVISION OF CHEMICAL RESEARCH AND DEVELOPMENT PROGRESS REPORT [FOR] PERIOD ENDING JUNE 16, 1945. June 28, 1945. Decl. Feb. 14, 1956. 53p. Contract W-7401-eng-23. (CD-MPR-17). $9.30(ph OTS); $3.60(mf OTS).

8797 AECD-4175
Tennessee Eastman Corp., Oak Ridge, Tenn.
COMPILATION OF VARIOUS FUSION METHODS FOR THE DISSOLUTION OF INSOLUBLE RESIDUES. V. P. Calkins. Nov. 7, 1946. Decl. Feb. 13, 1956. 18p. Contract W-7401-eng-23. (C-0.320.6). $3.30(ph OTS); $2.40(mf OTS).

Different fusion processes were studied as one of the means of recovering U from various insoluble residues. The study was divided into three main parts by virtue of the three chief residues subjected to fusion processes; acid insolubles, alkaline insolubles, and refractory oxides. (auth)

8798 AECD-4203
Tennessee Eastman Corp., Oak Ridge, Tenn.
EFFECT OF $Cu(NO_3)_2$, $UO_2(NO_3)_2$ AND $Fe(NO_3)_3$ ON THE DISTRIBUTION COEFFICIENTS OF NITRATE ION IN THE SYSTEM DIBUTYL CARBITOL – NITRIC ACID. Buddy Warren and C. D. Susano. Sept. 29, 1945. Decl. Feb. 15, 1956. 17p. Contract W-7401-eng-23. (C-3.365.1) $3.30 (ph OTS); $2.40(mf OTS).

A study of the distribution coefficients was made for the dibutyl carbitol–nitric acid system in the range of 1 to 5N HNO_3 to establish more closely the break in distribution coefficients, found previously, when the acid concentration was increased from 2 to 4N. The study was then continued by adding various salting-out agents to the system. It was found that salting-out agents produce a great effect; in fact, they reverse the previously found curves. Although the break occurs in the same place, the more dilute (instead of the more concentrated) the HNO_3, the greater the distribution coefficient of the system. (auth)

8799 BBC-41
Brush Beryllium Co., Cleveland.
FLUORINATION OF BERYLLIUM HYDROXIDE WITH ANHYDROUS HYDROFLUORIC ACID. Progress Report for the Period October 1, 1948 to January 31, 1949. D. T. Doll May 24, 1949. Decl. Feb. 13, 1956. 35p. Contract W-22-075-eng-11. $6.30(ph OTS); $3.00(mf OTS).

The equipment, procedure used, and the results obtained from an experimental investigation directed toward the production of BeF_2 by hydrofluorination of $Be(OH)_2$ are described. Subsequent to the fluorination treatment, the fluorinated product obtained from the majority of runs was sublimed in a sublimation furnace at 950°C under pressure less than 500μ to purify the BeF_2. The process

was discontinued before reaching a stage where a conclusion could be shown. (J.E.D.)

8800 CF-51-10-149
[Oak Ridge National Lab., Tenn.]
PERCOLATION—ION EXCHANGE. S. H. Jury. Oct. 17, 1951. 33p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

Chemical control factors governing relative adsorption of ions, ionic potential, complex formation, and hydration were investigated for percolation ion exchange systems involving separation of U from Pu and fission products, decontamination and isolation of Pu, and the isolation of radioactive isotopes. (F.S.)

8801 CF-53-9-110
[Oak Ridge National Lab., Tenn.]
CALCULATION OF HTU's AND HETS's IN CONTINUOUS COUNTERCURRENT TRANSFER OPERATIONS WHERE CONSTANT "RELATIVE VOLATILITY" EXISTS. H. F. Johnson. Oct. 15, 1953. 16p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

8802 CF-53-10-4
Oak Ridge National Lab., Tenn.
INSTRUMENTATION FOR RADIOCHEMICAL PROCESSING RECOVERY OF IODINE^{131}. Justus N. Baird, Jr. [Oct. 1953]. 20p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

Aspects of radiochemical and conventional processes are contrasted. Instrumentation for the processing of I^{131} in fission products is presented as an example of current radiochemical instrument practice. (auth)

8803 DOW-24
Dow Chemical Co. Great Western Div., Pittsburg, Calif.
THE RECOVERY OF URANIUM FROM COMMERCIAL 30% PHOSPHORIC ACID WITH ANTIMONY. Summary Status Report. R. H. Bailes. Feb. 23, 1950. Decl. Dec. 28, 1955. 14p. Contract AT-30-1-GEN-236. $0.20(OTS).

Estimates of the cost of recovering one pound of U_3O_8 from commercial 30% H_3PO_4 including plant cost and credit for recovered $NH_4H_2PO_4$ are presented. (W.L.H.)

8804 HW-39080
Hanford Atomic Products Operation, Richland, Wash.
EFFECT OF ULTRASONICS ON DISSOLUTION OF NICKEL IN NITRIC ACID. R. W. Wirta and R. C. Smith. Sept. 20, 1955. 6p. Contract W-31-109-eng-52. $1.80 (ph OTS); $1.80(mf OTS).

Ultrasonic energy was found to increase the rate of dissolution of Ni in HNO_3 markedly. (auth)

8805 K-621
Carbide and Carbon Chemicals Corp. K-25 Plant, Oak Ridge, Tenn.
LABORATORY DEVELOPMENT OF THE UAP PROCESS. J. C. Barton and R. H. Rainey. Aug. 4, 1950. Decl. Dec. 27, 1955. 79p. Contract [W-7405-eng-26]. $0.45(OTS).

The laboratory research and development of a process for the recovery of U from aged Hanford metal waste by precipitation as uranyl ammonium phosphate (UAP) is described. The product UAP, representing 99% of the U in the waste, can be handled in conventional equipment and has an inhalation hazard only 31% greater than normal U. It can easily be converted to UF_6 or to U for re-use in project installations. In the standard UAP Process, aged Hanford metal waste is dissolved at 85°C in the presence of a small amount of H_3PO_4, by the careful addition of 60% HNO_3. Approximately 95% of the U is precipitated as UAP at a pH of 0.1 to 0.2 by the addition of NH_4NO_3. Slow cooling permits the crystals to perfect themselves and to expel fission products which may be removed by washing. The washed precipitate is then dissolved and the precipitation and washing procedures are repeated. The U which remains in the combined filtrates and washes from the precipitation steps is recovered by raising the pH to 1.5 to 2.0 with NaOH. Material thus recovered from 8 to 10 runs is processed as a new batch. Sodium hydroxide is added to the final waste solutions of the process to insure decomposition of NH_4NO_3 upon boiling. Evaporation of the alkaline process waste to approximately 120% of the volume of the original metal waste produces a solution saturated at 20°C, the evaporator condensates being dischargeable to the ground. A modified UAP process which received limited investigation, gives 99% uranium recovery without a recycle step and decontamination factors equal to those obtained by the standard procedure. (auth)

8806 KAPL-8
Knolls Atomic Power Lab., Schenectady, N. Y.
4-METHYL-2-PENTANONE (HEXONE). Charles A. Burkhard. Nov. 17, 1947. Changed from OFFICIAL USE ONLY Feb. 20, 1956. 36p. Contract [W-31-109-eng-52]. $6.30(ph OTS); $3.00(mf OTS).

An investigation was made to determine the impurities present in hexone, to determine the reaction products of hexone with HNO_3 and $K_2Cr_2O_7$ mixture, to prepare a pure sample of hexone, and to determine some of the physical properties of purified hexone. (auth)

8807 M-1048
Brown Univ., Providence.
INVESTIGATIONS ON THE DISTRIBUTION OF $RO_2(NO_3)_2$ [$UO_2(NO_3)_2$] BETWEEN H_2O AND ORGANIC SOLVENTS. Monthly Report No. 8. Charles A. Kraus. May 24, 1944. Decl. Jan. 27, 1956. 4p. (BM-8). $1.80(ph OTS); $1.80(mf OTS).

The distribution of $UO_2(NO_3)_2$ between diethyl cellosolve and H_2O was investigated. The addition of salts (e.g., NH_3NO_3, $Ca(NO_3)_2$, and $Cu(NO_3)_2$ caused the distribution to shift in favor of the organic solvent. (C.W.H.)

8808 M-2115
Purdue Univ., Lafayette, Ind.
THE PREPARATION AND REACTIONS OF CERTAIN COMPOUNDS OF URANIUM. Monthly Technical Report [for] March 1, 1946 to April 1, 1946. E. T. McBee, D W. Pearce, and Z. D. Welch. Decl. Jan. 26, 1956. 26p. Contract W-7405-eng-74. $4.80(ph OTS); $2.70(mf OTS).

Recovery of U from synthetic β-gunk and its conversion to UCl_4 by vapor phase chlorination was studied. Removal of U from U peroxide effluents by precipitation with Fe using NH_4OH was studied. High purity UCl_4 was obtained by the reaction of hexachloropropene with calcined $UO_2(NO_3)_2$. Conditions affecting the reduction of Fe^{3+} with hydroxylamine were studied. Solutions of U^{4+} contaminated with Th^{4+}, Cu^{2+}, and Fe^{3+} have been purified by electrolysis and by H_2S. A procedure for the determination of small amounts of U^{4+} in Th^{4+} peroxide effluents was developed and tested. (W.L.H.)

8809 MITG-228
Massachusetts Inst. of Tech., Watertown. Mineral Engineering Lab.
MISCELLANEOUS PRECIPITANTS FOR URANIUM IN PHOSPHORIC ACID SOLUTIONS. D'Arcy R. George. Mar. 6, 1950. Decl. Jan. 25, 1956. 14p. Contract AT-30-1-Gen-211. $0.15(OTS).

Tests were conducted to determine effectiveness of various reagents as coprecipitants for uranium in Anaconda 27°Bé H_3PO_4 and spiked c.p. H_3PO_4. The most effective reagents were compounds of Sb. Finely ground monazite showed promise as a precipitant for U. (auth)

8810 MITG-233

Massachusetts Inst. of Tech., Cambridge. Mineral Engineering Lab.

LEACHING OF SUPERPHOSPHATES WITH SATURATED SOLUTIONS. Robert L. Barnard. July 1, 1950. Decl. Jan. 11, 1956. 18p. Contract AT-30-1-gen-211. $3.30(ph OTS); $2.40(mf OTS).

The process of leaching superphosphate products with saturated superphosphate solutions and stripping the pregnant solutions with Al metal by pseudocementation appears unattractive under the conditions used. A slight tendency toward selective leaching of U is exhibited but the stripping process is inefficient and the stripped solutions cannot be recycled because no further leaching is accomplished after stripping. (auth)

8811 MITG-234

Massachusetts Inst. of Tech., Cambridge. Mineral Engineering Lab.

DRY SCRUBBING OF WESTERN PHOSPHATE ORES. Edmund G. Brown. May 22, 1950. Decl. Jan. 11, 1956. 9p. Contract AT-30-1-Gen-211. $3.30(ph OTS); $2.40(mf OTS).

Three western phosphate ores, two of which were of submarginal grade, were beneficiated by dry scrubbing and air classification. The treatment given did not result in the production of an acid-grade phosphate product from the two submarginal grade ores, but the one already of acid grade was improved by 3.5% P_2O_5. No appreciable concentration of the U was effected. Scrubbing was done by self-attrition in a cylindrical mill and by treatment in a slow-moving cylindrical mill with steel punchings. The latter treatment gave the better results. (auth)

8812 MITG-A38

Massachusetts Inst. of Tech., Watertown, Mass. Mineral Engineering Lab.

DIFFERENTIAL PRECIPITATION OF U_3O_8 FROM IRON BY NEUTRALIZATION. John J. Brunner. June 21, 1948. Decl. Apr. 11, 1956. 23p. Contract [W-7405-eng-85]. $4.80(ph OTS); $2.70(mf OTS).

The leach liquors from 396 ores contain, in addition to U_3O_8, ferrous and ferric iron, Al_2O_3 and SiO_2. As ferric hydroxide precipitates in the range pH 2.2 to 3.5, U_3O_8 hydrate in the range pH 4.0 to 5.5, and ferrous hydroxide at pH 5.5 to 8.0, separation of U_3O_8 from both ferrous and ferric iron by neutralization at a definite pH has been attempted. A maximum of 86% of the U_3O_8 present in solution was recovered in a precipitate assaying up to 13% U_3O_8 and 5 to 15% Fe. The separation of U_3O_8 can be obtained either by precipitating ferric iron, U_3O_8, and ferrous iron separately or by precipitating ferric iron and U_3O_8 together, re-acidifying to dissolve the U_3O_8 and reprecipitating the U_3O_8. With each method recoveries up to 99% of the U_3O_8 present were obtained in the three precipitates. In the tests with the three-step method of precipitation, over 50% of the ferrous iron was left in the barren solution. The ferrous iron precipitate should be oxidized and returned to the leaching cycle along with the ferric iron precipitate. This will avoid loss of the U_3O_8 contained in the Fe precipitates. Most of this U_3O_8 is in the ferrous iron precipitate if ferric iron and U_3O_8 are precipitated separately, and in the ferric precipitate if U_3O_8 and ferric iron are precipitated together and separated subsequently by re-acidification. A cyclic test was run using a three-step precipitation and carrying out the ferric precipitation while the ore was still present. The U_3O_8 extraction in the cyclic test was very poor because the ferrous iron precipitation was only 10% complete. Bleeding 90% of the ferrous iron from the cycle resulted in having an inadequate amount of oxidizing agent present during the leaching step to obtain a satisfactory extraction. The U_3O_8 precipitates from the cyclic test assay 4% U_3O_8, 50% Al_2O_3, 18% Fe oxide and 25% SiO_2. Colloidal hydroxide precipitates were somewhat difficult to filter, and the precipitation of colloidal hydroxides was not reproducible. This lack of reproducibility would make operation of a plant using this process quite difficult and constitutes the major objection to the use of this process. (auth)

8813 MonT-181

Clinton Labs., Oak Ridge, Tenn.

THE SEPARATION OF SODIUM URANYL ACETATE PRECIPITATED BY FLOTATION (1200-L-10). Progress [for] July 1, 1946 to September 1, 1946 [on] Problem Assignment Number TX5-11. W. H. Pennington. Oct. 7, 1946. Decl. Jan. 30, 1956. 13p. Contract W-7405-eng-39. $3.30(ph OTS); $2.40(mf OTS).

Using surface active agents it was possible to separate sodium uranyl acetate precipitates from solutions by flotation, on a laboratory scale. It is recommended that the problem be investigated further for application to remote control separations. (auth)

8814 NYO-1116

Brush Beryllium Co., Cleveland.

IRON REMOVAL FROM BERYLLIUM SOLUTIONS BY SOLVENT EXTRACTION METHODS. R. B. Byersmith, C. S. Pomelee, and I. Birnbaum. June 25, 1953. Decl. Jan. 6, 1956. 61p. Contract AT(30-1)-541. $0.40 (OTS).

A process for the removal of iron from crude beryllium sulfate solutions as obtained from beryl ore by means of liquid-liquid solvent extraction is described. This method consists of the extraction of the ferric thiocyanate complex from aqueous beryllium sulfate solution of the proper pH with a mixture of tributylphosphate and kerosene. Studies on mixer-settler and column operations are discussed. A column design for production use is presented along with expected construction, material and operating costs for a plant installation. (auth)

8815 NYOO-80

Foote Mineral Co., Philadelphia.

LOW-HAFNIUM ZIRCONIUM PROJECT PROGRESS REPORT FOR JULY 15 TO SEPTEMBER 16, 1949. S. C. Ogburn, Jr., and H. M. Fisher. Sept. 23, 1949. Decl. Jan. 11, 1956. 11p. Contract [AT(30-1)-543]. $1.80 (ph OTS); $1.80(mf OTS).

Sixteen distillations of $ZrCl_4 - POCl_3$ complex and 15 redistillations were made in the 1-in.-diameter column. From redistilled complex containing less than 0.1% Hf, 3308 g of Zr oxide was produced, of which 1340 g has a Hf content of 0.01%. Experimental work indicates that decomposition of complex with cold alcohol, water and ammonia is the best process available. A Zr compound, free of P, can be prepared with anhydrous HF or ammonium bifluoride. This Zr compound contains about 20% F, little Cl, and is not ZrF_4 but appears to be an oxide. An amino-$ZrCl_4$ salt, stable to hydrolysis, can be precipitated with anhydrous ammonia gas to an alcohol–ether solution. (F.S.)

8816 ORNL-1500

Oak Ridge National Lab., Tenn.

RECOVERY OF URANIUM AS A SINGLE PRODUCT FROM THE FLORIDA LEACHED ZONE. C. F. Coleman. Mar. 31, 1953. Decl. Mar. 14, 1956. 131p. Contract W-7405-eng-26. $0.65(OTS).

A wide variety of ore samples from the Florida leached zone were studied for extraction of U, and for recovery of U from the resulting pregnant liquor. Most but not all of the samples appeared amenable to a process using a

minimum quantity of H_2SO_4 to extract the most readily soluble fraction of the U from the classified ore fines, followed by anion exchange sorption of U from the clarified liquor. Variations of this process were also studied to a limited extent, including leaching of unclassified ore, recovery of U from the clarified liquor by precipitation or liquid-liquid extraction, and avoidance of filtration by means of slurry-liquid extraction or resin-in-pulp leaching. In addition to the phosphate extractions, phosphate was determined in many of the low acid leaches of several different ores. These data are not of direct significance to a process for U alone, but they may furnish information of some value to other processes, and hence are summarized. (auth)

Refer also to abstracts 8900 and 8901.

SORPTION PHENOMENA

8817 CF-50-2-108
Oak Ridge National Lab., Tenn.
ON PHYSICAL ADSORPTION. IV. A COMPARISON OF TWO THEORIES OF MULTILAYER ADSORPTION. Sydney Ross. Feb. 22, 1950. 23p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

A new theory of multilayer adsorption is compared with the B.E.T. theory, using experimental isotherms, some already published and some never before published. The new theory is shown to describe the experimental results with greater precision. The differences in the postulated physical mechanisms of the two theories are pointed out. The basis for a modification, designed to provide a still more precise description of the experimental observations, is suggested. (auth)

URANIUM AND URANIUM COMPOUNDS

8818 AECD-4039
Iowa State Coll., Ames.
IMPROVED DIRECTIONS FOR THE PREPARATION OF $U(OC_2H_5)_5$ (To replace the directions submitted April 12, 1943). Nov. 20, 1943. Decl. Jan. 11, 1956. 10p. (M-5073). $1.80(ph OTS); $1.80(mf OTS).

8819 AECD-4110
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE COPRECIPITATION OF THORIUM AND URANIUM PEROXIDES. P. F. Grieger and C. E. Larson. Feb. 20, 1946. Decl. Jan. 27, 1956. 23p. Contract W-7401-eng-23. (C-0.380.4). $4.80(ph OTS); $2.70(mf OTS).

The recovery of U from Beta-machine-wash-solution waste by the coprecipitation with ThO_2 was investigated. The U content of the waste can be reduced to less than 1 mg/gal by this treatment. Fluorimetric and radiometric methods were outlined for the determination of U in the presence of Th. (C.W.H.)

8820 AECD-4125
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE METHODS OF PREPARING ANHYDROUS TUBALLOY [URANIUM] TETRACHLORIDE. E. L. Wagner, comp. Feb. 1946. Decl. Feb. 14, 1956. 77p. (C-0.350.9). $12.30(ph OTS); $4.50(mf OTS).

Chlorination processes for the preparation of anhydrous UCl_4 have been satisfactorily developed to satisfy the present plant requirements. A number of experimental methods have been investigated which are of value for special purposes and from which it may be possible to develop a process which will better satisfy the changing plant requirements. The main requirements for a plant chlorination process are that the product be 99% or greater UCl_4, that the losses be negligible, that the holdup be less than 2% that the time cycle be short, and that the equipment be convenient to handle and nearly 'foolproof'. (auth)

8821 AECD-4178
Tennessee Eastman Corp., Oak Ridge, Tenn.
THE PREPARATION OF TUBALLOY OXYFLUORIDE [URANYL FLUORIDE] IN GREEN SALT BOX-TYPE REACTORS. K. O. Johnsson and G. H. Clewett. Feb. 27, 1946. Decl. Feb. 15, 1956. 9p. Contract W-7401-eng-23. (C-5.355.7) $1.80(ph OTS); $1.80(mf OTS).

Uranium oxyfluoride can be readily prepared in equipment used for green salt production. Starting with UO_3 the process consists of preheating to 300°C in O, hydrofluorinating with anhydrous HF diluted with O and finally sweeping with N. A product can be made which is 99.9% water soluble and which contains less than 1.5% water. (auth)

8822 AECD-4179
Tennessee Eastman Corp., Oak Ridge, Tenn.
PREPARATION OF UCl_4 WITH HEXACHLOROPROPYLENE AND OTHER CHLORINATED ORGANIC COMPOUNDS. A. J. Miller and L. B. Dean. Apr. 29, 1946. Decl. Feb. 16, 1956. 24p. Contract W-7401-eng-23. (C-0.350.14). $4.80(ph OTS); $2.70(mf OTS).

In a survey of many chlorinated organic compounds it was discovered that hexachloropropylene is unique in that it converts UO_3 in a liquid phase reaction at atmospheric pressure to a pure UCl_4. Further investigation with hexachloropropylene showed that it also produces tetrachloride from both wet UO_4 cake and U_3O_8. With UO_3, 4 reaction methods were found to be satisfactory: Heating and refluxing a mixture of trioxide and hexachloropropylene, heating and partially distilling off the liquid by-products, addition of the trioxide to hot hexachloropropylene, and refluxing the mixture of trioxide and hexachloropropylene in a closed vessel, a reaction in which only a relatively small pressure is developed. It was shown that the UCl_4 produced can be dried either by washing with CCl_4 or by total distillation of the organic matter at 400 to 500°C. (auth)

8823 AECD-4192
Tennessee Eastman Corp., Oak Ridge, Tenn.
OPTIMUM CONDITIONS FOR THE "HOT ZONE" VOLATILIZATION OF TCl_4 [UCl_4]. C. E. Crompton, V. P. Calkins, and C. E. Larson. Feb. 19, 1946. Decl. Feb. 15, 1956. 6p. Contract W-7401-eng-23. (C-0.350.11) $1.80 (ph OTS); $1.80(mf OTS).

The data reported herein furnish a qualitative comparison of the rapidity of vaporization of UCl_4 at various "hot zone" temperatures as well as a measure of the Cl evolution attributed to its thermal decomposition. The presence of impurities in the UCl_4 detracts from the significance of the reported Cl evolution. The temperature recommended for rapid volatilization is 750°C at which UCl_4 underwent thermal decomposition amounting to no more than 0.2% by weight. (auth)

8824 AECD-4193
Tennessee Eastman Corp., Oak Ridge, Tenn.
VOLATILIZATION OF MOLYBDENUM DURING THE PREPARATION OF [UF_4 AND U_3O_8 FROM UO_3]. L. B. Wick, Boyd S. Weaver, and J. W. Gates, Jr. Sept. 18, 1945. Decl. Feb. 13, 1956. 8p. Contract W-7401-eng-23. (C-1.385.1). $1.80(ph OTS); $1.80(mf OTS).

Uranium tetrafluoride which was prepared from MoO_3-contaminated UO_3 by treatment with H_2–HF contained very little Mo. It was suggested that this result was due to the reduction of MoO_3 to Mo and the subsequent passivity of the Mo. If the Mo is present as molybdates of various cations, formation of volatile fluorides proceeds exclusively. (C.W.H.)

8825 AECD-4205

Tennessee Eastman Corp., Oak Ridge, Tenn.

A MILL FOR THE QUANTITATIVE GRINDING OF TF_4 [UF_4]. A. D. Webb, W. F. Peed, L. H. Pancoast, and K. O. Johnsson. May 7, 1945. Decl. Feb. 15, 1956. 9p. Contract W-7401-eng-23. (CD-4022). $1.80(ph OTS); $1.80 (mf OTS).

A monel metal rod mill has been designed, built, and tested for grinding 500 g batches of anhydrous UF_4 to a fineness such that 100% will pass an 80-mesh screen; the grinding being accomplished without loss of material, and with the addition of less than 200 ppm of contaminating metals. The grinding time per batch is not more than 50 min. (auth)

8826 AECD-4235

Carbide and Carbon Chemicals Co. K-25 Plant, Oak Ridge, Tenn.

HYDROLYSIS OF URANIUM TETRA-FLUORIDE. Harvey A. Bernhardt. Jan. 10, 1953. Decl. Feb. 8, 1956. 4p. Contract [W-7405-eng-26]. (KLI-1918). $1.80(ph OTS); $1.80(mf OTS).

A direct determination of the equilibrium constant of the reaction $UF_4 + 2H_2O \rightleftharpoons UO_2 + 4HF$ was made in the temperature range 200 to 500°C. The results are summarized and expressed graphically. (auth)

8827 FMPC-78

National Lead Co. of Ohio, Cincinnati.

DETERMINATION OF THE WEIGHT OF URANIUM METAL CONTENT UNDER OIL IN DRUMS. H. C. Zeitz. July 18, 1952. Decl. Dec. 7, 1955. 20p. Contract AT(30-1)-1156. $0.20(OTS).

An investigation of a new, rapid, and reasonably accurate means of determining the weight of U metal in an oil-metal mixture is reported. The work is based on the assumption that all the scrap will be stored under oil in either 55 or 30 gal. steel drums. The primary factors in the problem are the densities of the U metal and oils, separate weights of U, oil, and drums, and the volumes of these three. Nomographs were constructed for each of the two types of drums. (auth)

8828 M-884

[Brown Univ., Providence.]

MONTHLY REPORT — EXTENSION OF OEMsr-290. Charles A. Kraus. July 16, 1942. Decl. Jan. 11, 1956. 2p. (BT-3). $1.80(ph OTS); $1.80(mf OTS).

Solutions of UO_3 in HCl were measured over a wide range of concentrations and a triangular phase diagram for the system UO_3–HCl–H_2O was constructed. Transference experiments were made with 0.1 equivalent Cl per 1000 of solutions of varying amounts of UO_3. The behavior of freshly precipitated silicic acid plugs in water was studied. (F.S.)

8829 M-1369

Du Pont de Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del.

COMPARISON OF LOW-F STARTING MATERIALS IN THE [UNH] ETHER EXTRACTION OPERATION. Alvan Donnan. Oct. 27, 1944. Decl. Feb. 16, 1956. 9p. Contract W-7412-eng-151. (JWD-33). $1.80 (ph OTS); $1.80(mf OTS).

In the UNH Ether Extraction Process, U_3O_8 which was prepared from low-quality UO_4 gave higher extraction yields than commercial UO_4. The U_3O_8 was practically fluoride free. (C.W.H.)

8830 M-3015

Du Pont de Nemours (E. I.) & Co. Jackson Lab., Wilmington, Del.

LABORATORY CONTROL PROCESS FOR THE PREPARATION OF C-112 [URANIUM PEROXIDE] FROM C-105 [HIGH METAL CONTENT] CONCENTRATES BY AQUEOUS SULFATION. I. W. Dobratz. Sept. 14, 1943. Decl. Jan. 10, 1956. 17p. Contract W-7412-eng-151. $1.80(ph OTS); $1.80(mf OTS).

The waste concentrates (dross, turnings, etc., of high U content) are reacted with H_2SO_4 to dissolve the metal sulfates and remove $CaSO_4$. After pH adjustment, H_2O_2 is added to the solution to precipitate UO_4. (C.W.H.)

8831 MITG-262

Massachusetts Inst. of Tech., Watertown. Mineral Engineering Lab.

THE EXTRACTION OF URANIUM FROM MARYSVALE ORES Q4, Q5, Q6, AND Q7. R. H. Kennedy, D. George, E. G. Brown, S. B. Michal, P. Galvanek, Jr., and F. W. Bloecher, Jr. Feb. 28, 1951. Decl. Jan. 11, 1956. 71p. Contract AT-30-1-gen-211 & AT(49-1)-533. $0.45(OTS).

The investigation of U recovery from Marysvale ores Q4, 5, 6 and 7 is described. The test work indicates that U recoveries of 88 to 98 per cent may be obtained by cold H_2SO_4 leaching and anion exchange. Cold carbonate leaching does not appear as promising as acid leaching. A locked-batch cyclic acid leaching and ion exchange test showed no detectable change in the adsorptive characteristics of the resin over 21 cycles of operation. Methods designed to produce a satisfactory grade of final product from the leach liquor by selective precipitation did not give recoveries or product grades comparable to those obtained by ion exchange. Methods of producing high purity final products from ion exchange eluates are described. Preliminary lyometallurgical tests indicate that the U may be readily recovered from these ores by solvent leaching after static digestion at 85 to 90 per cent solids with H_2SO_4. (auth)

8832 RL-4.6.921

[California. Univ., Berkeley. Radiation Lab.]

MIXED HALIDES OF TUBALLOY [URANIUM] INVOLVING CHLORINE, BROMINE, AND IODINE. N. W. Gregory. July 4, 1945. Decl. Sept. 15, 1955. 17p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

Nearly all the possible mixed halide compounds of U in the tri- and tetra-valent states involving Cl_2, Br_2, and I_2 have been prepared and isolated. A summary of the information acquired regarding the best method of preparation and of the properties observed for each of these compounds is given, including references to previous reports, and new compounds prepared more recently. (auth)

8833 RL-4.6.923

[California. Univ., Berkeley. Radiation Lab.]

THERMAL ANALYSIS OF TCl_4, TBr_4, TCl_3, AND TBr_3 [UCl_4, UBr_4, UCl_3 and UBr_3] BETWEEN 100°C AND 500°C. N. W. Gregory. Aug. 1, 1945. Decl. Sept. 15, 1955. 17p. Contract W-7405-eng-48. $3.30(ph OTS).

A comparison of thermodynamic data obtained from H reduction studies on UCl_4 and UBr_4 to their respective trivalent salts between 400 and 500°C with that obtained from heat of formation determinations from heat of solution measurements and specific heat data extrapolated from room temperature reveals a discrepancy which may be explained if a transition exists in the temperature region between the two experiments. Hence it was deemed of interest to study the behavior of these salts between room temperature and 500 to 550°C. (auth)

8834 RL-4.6.940

[California. Univ., Berkeley. Radiation Lab.]

THE HYDROGEN REDUCTION EQUILIBRIUM OF $UOBr_2$. N. W. Gregory. Dec. 13, 1945. Decl. Sept. 15, 1955. 6p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

The equilibrium $UOBr_2 + H = UOBr + HBr$ was studied at temperatures below 450°C in order to prevent dissociation of $UOBr_2$ into UBr_4 and UO_2. (auth)

8835 Y-361
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
PROGRESS REPORT ON SHALE STUDIES FOR THE MONTH OF FEBRUARY 1949. K. B. Brown, W. R. Grimes, and C. D. Susano. Mar. 14, 1949. Decl. Jan. 13, 1956. 24p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

Work was concerned with particle size effect on low-temperature shale burning, leaching burned shale, dissolved materials other than U during acid leach-roast-water leach treatment of shale, correlation of S and U contents of shale, large-scale roasting operations, and filtering and settling properties of shales. (F.S.)

8836 Y-379
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
PROGRESS REPORT ON SHALE STUDIES FOR THE MONTH OF MARCH 1949. K. B. Brown, W. R. Grimes, and C. D. Susano. Apr. 11, 1949. Decl. Jan. 13, 1956. 28p. Contract W-7405-eng-26. $4.80(ph OTS); $2.70(mf OTS).

The shale program was concerned with large scale shale roasting, leaching characteristics of shales ignited at high temperatures, a five-stage cascade soaking leach on roasted ore and a five-stage cascade leach using the acid leach, intermediate roast, and second leach treatment. (F.S.)

8837 Y-404
Carbide and Carbon Chemicals Corp. Y-12 Plant, Oak Ridge, Tenn.
PROGRESS REPORT ON SHALE STUDIES FOR THE MONTH OF APRIL 1949. K. B. Brown, W. R. Grimes, and C. D. Susano. May 11, 1949. Decl. Jan. 13, 1956. 30p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

During this period, work on the shale program was concerned with U_3O_8 sample preparation from oil shale for isotopic assay, determination of the rate of SO_2 evolution upon roasting shale, and large-scale roasting, leaching, and filtering tests on shale. (F.S.)

WASTE DISPOSAL

8838 HW-19852
[Hanford Works, Richland, Wash.]
NEUTRALIZATION OF ACIDIC DISTILLATES WITH LIMESTONE. H. L. Brandt and R. E. Burns. Dec. 27, 1950. Changed from OFFICIAL USE ONLY Feb. 20, 1956. 7p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80 (mf OTS).

Laboratory investigations are presented for the suitability of some commercially available limestones for neutralization of slightly acidic distillates. Observations were made of flow rates, solution acidities, and temperatures. (W.L.H.)

8839 HW-37956
Hanford Atomic Products Operation, Richland, Wash.
WELDABILITY TESTS OF FOUR HIGH STRENGTH STRUCTURAL STEELS. G. W. Riedeman. Aug. 9, 1955. 8p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

As part of a design program for HAPO waste storage tanks, a study was made of possible fabrication materials. This study revealed that the steels which were tested can be welded without the benefit of preheat and or postheat treatment for structural applications involving materials about one-half inch in thickness using low-hydrogen, iron-powder-coated electrodes. (W.L.H.)

8840 HW-38468
Hanford Atomic Products Operation, Richland, Wash.
PUREX COOLING WATER DISPOSAL SCOPE STUDY. J. P. Corley. Sept. 21, 1955. 19p. Contract [W-31-109-eng-52]. $4.80(ph OTS); $2.70(mf OTS).

Results are reported from a survey of various liquid waste disposal schemes. Recommendations are presented for the disposal of Purex waste cooling water by discharge to a natural depressed area. Advantages and disadvantages of the procedure are discussed. (C.H.)

8841 HW-39658
Hanford Atomic Products Operation, Richland, Wash.
PRODUCTION OF ACIDITY IN STORED WASTE. L. L. Burger. Oct. 26, 1955. 3p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

The contemplated use of air-lift pumps to promote liquid circulation in waste storage tanks has raised the question of N fixation in the air by the high radiation. This production of oxides of N, known to occur primarily in the gas phase rather than through dissolved N, would result in a continued rise in acidity in the waste solution with attendant corrosion problems. A parallel question concerns the neutralization produced by the CO_2 present in atmospheric air. N fixation in the air by radiation, highest in the case of Purex wastes, should contribute at most a few millimoles of acid per liter of solution per year. An air rate of 5×10^{-6} cfm per liter of waste would introduce acidity from the CO_2 present at a rate of 1.7 millimoles per liter per year, also an insignificant rate. More acidity may conceivably be produced by radiation decomposition of organic matter present. (auth)

ENGINEERING

8842 A-1971
Saunders (Kerby) Inc., New York.
NITROUS OXIDE REFRIGERATION DEVELOPMENT. Job D-1019. [1944?] Decl. Dec. 5, 1955. 107p. Contract W-7405-eng-23, Subcontract 44. $43.20(ph OTS); $11.10(mf OTS).

Design drawings and operating characteristics for a pilot plant N_2O refrigeration system are given. (D.E.B.)

8843 HW-28897
Hanford Atomic Products Operation, Richland, Wash.
STRENGTH PROPERTIES OF JOINT DESIGNS FOR JOINING TUBES TO TUBE SHEETS. W. R. Smith. July 31, 1953. 6p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Joints prepared by welding and any combination of welding and rolling exhibited much greater strengths with less variation than those prepared by rolling alone. Rolling prior to welding had no effect on the strength of the joint, and any rolling performed after welding appeared to add little strength to the joint. A groove in the tube sheet did not appear to increase the strength of rolled joints by any significant amount. The joint design used for welding the tubes to the tube sheet is such that the welds can be made with reproducible results. Since the strength of a rolled joint is dependent on the yield point strength of the individual tubes, there is a wide variation in the strength of the rolled joints. (auth)

8844 HW-38644
Hanford Atomic Products Operation, Richland, Wash.
EVALUATION OF GLASS-CLAD BAYONET HEATERS. J. T. Krieg and L. C. Amos. July 29, 1955. 7p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

The superior corrosion resistance of glass to acid solutions suggests its potential use as a cladding on process equipment. In the past glass-clad equipment has usually been avoided because of potential failure from shock and/or corrosion through pin-hole defects in the cladding. The results of evaluation tests made on several glass-coated bayonet heaters are reported. The glass-coated heaters were found to be resistant to thermal shock, mild mechanical shock, and chemical attack by boiling 60% HNO_3. Over-all heat transfer coefficients of 60 to 100 btu/hr., sq.ft., °F. were obtained when boiling 60% HNO_3; however, heat coefficients of 185 to 273 btu/hr., sq.ft., °F. were obtained using a similar all-stainless-steel heater. A rough-glass surface exhibited superior heat transfer properties to a smooth surface; however, roughening the glass-cladding with a HF etch weakened its resistance to shock and corrosion. (auth)

8845 KAPL-M-JRB-1
[Knolls Atomic Power Lab., Schenectady, N. Y.]
THE EFFECT OF SCHEDULING ON THE STEAM PRESSURE TRANSIENTS OCCURRING IN A STEAM POWER PLANT. J. E. Barnes. Mar. 1, 1951. Decl. Feb. 7, 1956. 8p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

HEAT TRANSFER AND FLUID FLOW

8846 AECD-3975
Battelle Memorial Inst., Columbus, Ohio.
HEAT-TRANSFER AND FRICTION-FLOW CHARACTERISTICS OF CYLINDRICAL PARALLEL RODS WITH TRANSVERSE CYLINDRICAL SPACERS. R. E. Grimble, W. H. Bell, and S. L. Fawcett. June 29, 1954. Decl. with deletions Nov. 29, 1955. 13p. Contract W-7405-eng-92. $0.15(OTS).

Heat-transfer and pressure-drop measurements were made on a Lucite model of a reactor-fuel-element subassembly. The design configuration consisted of an array of cylindrical rods parallel to the fluid stream and supported at regular intervals by banks of transverse rods. The surface heat transfer was measured by the cyclically varying temperature method. Empirical relationships were obtained relating the Stanton number and the friction factor to the Reynolds number and transverse-rod spacing. (auth)

8847 CF-51-10-21
Oak Ridge National Lab., Tenn.
DAMPING COEFFICIENTS IN THE MODIFIED PRESSURIZER TUBE. G. T. Trammell and R. E. Aven. Oct. 2, 1951. Decl. Feb. 7, 1956. 7p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Methods for calculating frictional damping coefficients are developed. (D.E.B.)

8848 CF-53-7-225
Oak Ridge National Lab., Tenn.
PRESSURE DROP STUDIES IN A TWELVE INCH SPHERE UTILIZING ROTATING TYPE FLOW. J. I. Lang and I. Spiewak. July 20, 1953. 27p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

On the basis of experimental data obtained in a 12-inch sphere with four tangential inlets and two polar outlets, a generalized correlation is presented for over-all pressure drop in spheres with tangential inlets and polar outlets. The tangential velocity distribution in the region between the inlet, and outside radius of the outlet pipe, is described. (auth)

8849 CF-53-8-43
Oak Ridge National Lab., Tenn.
THERMODYNAMIC STUDY OF AMMONIA–WATER HEAT POWER CYCLES. James D. Maloney, Jr. and Roy C. Robertson. Aug. 10, 1953. 60p. Contract [W-7405-eng-26]. $0.40(OTS).

A study was made to determine whether an absorption-type power cycle using a mixture of ammonia and water as the working fluid, in a system such as that illustrated would afford higher thermal efficiencies than those obtainable from a comparable steam power cycle. It was found that the thermal efficiency of the ammonia-water power cycle is less than that of a typical steam power cycle. The efficiency of the ammonia-water cycle may slightly exceed that of a simple non-regenerative saturated steam cycle when boiler temperatures are above 350°F and the minimum exhaust quality is maintained at 83.5 percent, but the efficiency could never equal those of non-regenerative steam cycles operated with 30°F or more of superheat, but between the same over-all temperature limits, and could never significantly exceed the efficiencies of a saturated steam cycle using two or more feedwater heaters. The above statement is true over the range of boiler temperatures investigated (280 to 380°F), and there is reason to believe that the same situation exists at higher temperatures, although the present lack of ammonia-water property data at the higher temperatures prevents computation of actual values. The efficiency of the ammonia-water cycle is less than that of a steam cycle throughout the range of ammonia concentrations that could be employed. This is also true when other variables are introduced, such as permissible exhaust qualities, superheating of vapor to turbine, temperature of heat rejection, general arrangement of ammonia-water cycle equipment, and assumed actual turbine efficiencies. A typical ammonia-water cycle efficiency is 20.7 percent while that of a saturated steam cycle operated between the same temperatures and permissible exhaust conditions is 21.4 percent without regeneration, and 22.5 percent with two open feedwater heaters. A steam cycle with 30°F superheat, but maintaining the same over-all temperature limits, would have an efficiency of 22.9 percent non-regenerative, and 24.1 percent using two feedwater heaters. It is concluded that an absorption-type ammonia-water power cycle has no significant thermodynamic advantage as a means of converting heat into useful work. A two-substance working fluid in which water is the more volatile component, such as a lithium chloride-water combination, may hold more promise, but to make studies of systems using such mixtures would require a great deal of preliminary effort to determine the thermodynamic properties. (auth)

8850 CF-54-2-37
[Oak Ridge National Lab., Tenn.]
THE MEASUREMENT OF FLUID VELOCITY BY A PHOTOGRAPHIC TECHNIQUE. John O. Bradfute. Feb. 4, 1954. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A method was devised and experimentally tested to measure the velocity distribution in a flowing fluid. The method does not require that the instrument be immersed in the fluid. (F.S.)

8851 CF-54-4-205
Oak Ridge National Lab., Tenn.
A FEASIBILITY STUDY OF FLOW VISUALIZATION USING A PHOSPHORESCENT PARTICLE METHOD. L. D. Palmer and G. M. Winn. Apr. 30, 1954. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Convective heat transfer in flow systems where heat is added to the fluid internally or through the duct walls is directly controlled by the shape of the average velocity profile as well as the character of the flow. A method is presented here which makes it possible to visualize the nature of fluid flow in a variety of transparent duct sys-

tems; features concerning the average velocity profile as well as the velocity fluctuations in the case of turbulent flow may be observed. An investigation has been made of a technique which utilizes phosphorescent materials to observe flow patterns. A beam of ultra-violet light is flashed through the region of a flowing fluid whose velocity profile is to be observed. The beam of phosphorescent particles which was generated in the flowing fluid by the ultra-violet light is slowly distorted by the flow into a curve which exactly represents the average velocity profile. It was desired to determine whether or not the phosphorescence of the particles was sufficiently intense so that the method could be used in a practical way. (auth)

8852 CF-54-11-37
Oak Ridge National Lab., Tenn.
A LAMINAR FORCED-CONVECTION SOLUTION FOR PIPES DUCTING LIQUIDS HAVING VOLUME HEAT SOURCES AND LARGE RADIAL DIFFERENCES IN VISCOSITY. H. F. Poppendiek. Nov. 5, 1954. 20p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

This memorandum presents a laminar, forced-convection analysis for long, smooth pipes whose flowing liquids contain uniform volume-heat-sources and have large radial differences in the absolute viscosity. The particular case of an insulated pipe wall is considered. Radial liquid temperature and velocity solutions are derived and graphed in terms of a new dimensionless modulus which physically is a measure of the importance of the radial viscosity variation on the forced convection. (auth)

8853 CF-55-10-7
Oak Ridge National Lab., Tenn.
HRP-CP: HEAT REMOVAL FROM A PROPOSED HYDROCLONE UNDERFLOW POT GEOMETRY FOR A VOLUME HEAT SOURCE. P. A. Haas and J. K. Langsdon. Oct. 5, 1955. 17p. Contract [W-7405-eng-26]. $0.20(OTS).

Convective heat transfer was shown to be effective enough to permit use of a simple cylindrical geometry with an annular cooling jacket for the HRP-CP hydroclone underflow pot. Electrical resistance heating of UO_2SO_4 solution was used to simulate the volume heating of fission products in a 6-in.-dia., 24-in. long pot. For steady-state temperatures with the 2.1-kw heat input being removed by the cooling water, the temperature difference between the hottest and coldest pot solution was less than 30°C. The flow pattern in the pot was a core of solution rising at about 2 in./min and a thin layer falling near the cooled wall at 10 to 15 times the velocity of the rising solution. The lower soup viscosity and greater density decrease per degree of temperature increase would make convective heat transfer more effective at the HRP-CP conditions of 250 to 300°C. (auth)

8854 HW-38067
Hanford Atomic Products Operation, Richland, Wash.
PRESSURE DROP AT LOW FLOW RATES OF WATER, HELIUM, AIR, AND CARBON DIOXIDE THROUGH SMALL COPPER TUBING. C. E. Huck. July 20, 1955. 26p. Contract [W-31-109-eng-52]. $4.80(ph OTS); $2.70 (mf OTS).

Pressure-drop curve data were obtained for water, air, CO_2, and He flowing through 100 ft of standard $^3/_{16}$-in., $^1/_4$-in. and $^3/_8$-in. Cu tubing at rates of 0 to 10 cfh. (F.S.)

Refer also to abstracts 8785 and 8981.

MATERIALS TESTING

8855 CF-52-3-123
Oak Ridge National Lab., Tenn.
A SIMPLIFIED APPARATUS FOR MAKING THERMAL GRADIENT DYNAMIC CORROSION TESTS. (Seesaw Tests). Anton deS. Brasunas. Mar. 13, 1952. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A simple device has been developed in which mass transfer and dynamic corrosion studies can be made with molten metal, hydroxide, fluoride, or any other molten medium. The test specimen, a metal tube approximately one-third full of the liquid under study, is gently rocked in a manner resembling a seesaw, so that the fluid flows by gravity to either end of the tube. One end is maintained at some suitable high temperature, whereas the other end is maintained at some lower temperature. After many such cycles, the tube may be sectioned for inspection. (auth)

8856 KAPL-M-WAH-2
Knolls Atomic Power Lab., Schenectady, N. Y.
REPORT ON STATIC SEAL TEST. Walter A. Heywood. Oct. 21, 1949. 12p. Contract W-31-109-eng-52. $3.30 (ph OTS); $2.40(mf OTS).

Tests were made on a gasket type seal of neoprene rubber. Four to twelve hold down bolts in steps of two were tried. One set of data was taken with a bolt tightening torque of 30 foot pounds and another set at 45 foot pounds. Leakage rates varied from 1.4×10^{-6} cc/sec for four bolts at 30 foot pounds to 0.011×10^{-6} cc/sec for ten bolts at 45 foot pounds. (auth)

PUMPS

8857 CF-53-5-102
[Oak Ridge National Lab., Tenn.]
TEST OF ALLIS-CHALMERS CANNED ROTOR MERCURY PUMP. J. R. Parrott. May 15, 1953. 10p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

MINERALOGY, METALLURGY, AND CERAMICS

8858 KAPL-M-WLF-1
Knolls Atomic Power Lab., Schenectady, N. Y.
THE FABRICATION OF AN EXPANSION JOINT WITH AN INCONEL "X" BELLOWS. Walter L. Fleischmann. Mar. 31, 1952. 6p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

Cleanliness from oil and grease while welding, a reduced atmosphere in the making of the inert-gas-shielded arc weld, and a tightly fit and held assembly during welding were found to be necessary in the fabrication of an expansion joint with an Inconel "X" bellows. (F.S.)

CERAMICS AND REFRACTORIES

8859 CT-3372
Massachusetts Inst. of Tech., Cambridge.
THE PREPARATION OF SMALL DENSE CRUCIBLES OF MAGNESIA. H. B. Barlett. Sept. 1945. Decl. Feb. 15, 1956. 22p. Contract W-7405-eng-175. $4.80(ph OTS); $2.70(mf OTS).

Methods are described for making small MgO crucibles possessing smooth, non-porous surfaces. Carbowax 4000 was the best temporary bond and lubricant of the many tested. Typical dies for pressing crucibles are shown and a small oxy-propane furnace is described for firing crucibles up to 1900°C. (auth)

8860 CT-3374
Massachusetts Inst. of Tech., Cambridge.
THE PRODUCTION OF CRUCIBLES FROM CERIUM SULFIDE, CeS. I. Amdur, G. Kavanagh, T. T. Magel, L. O. Mitchell, and W. C. Schumb. Sept. 1945. Decl. Aug. 17, 1953. 21p. Contract W-7405-eng-175. $4.80(ph OTS); $2.70(mf OTS).

Methods are described for preparing crucibles of CeS. CeO_2 reacts with H_2S at 1100°C in graphite reactors to form Ce_2S_3 which is then reduced to CeS with CeH_3 in a vacuum furnace at 2000°C. CeS is milled to a powder and pressed into crucibles with cetyl alcohol binder. After vacuum heating at about 125°C to remove the cetyl alcohol, the crucibles are vacuum fired up to 2000°C. Crucibles are brass colored, strong, ring like a bell when struck, and can be made with porosities as low as a few tenths of one per cent. (auth)

CORROSION

8861 AECD-3003(Rev.)
Battelle Memorial Inst., Columbus, Ohio.
THE DEVELOPMENT OF ALUMINUM–6 PER CENT MAGNESIUM WROUGHT ALLOYS FOR ELEVATED-TEMPERATURE SERVICE AND THEIR RESISTANCE TO CORROSION IN WATER AT TEMPERATURES UP TO 600°F. K. Grube and L. W. Eastwood. July 15, 1950. Decl. Nov. 22, 1955. 44p. Contract W-7405-eng-92. (BMI-T-38). $0.30(OTS).

A wrought aluminum-base alloy for elevated temperature has been developed with the following composition: 6% Mg, 0.5% Cr, and 0.10% Ti. This alloy has outstanding tensile properties at all temperatures up to 600°F. Its thermal neutron cross-section value is similar to that of pure Al. Corrosion tests of 2000 hours' duration in refluxing, boiling, distilled water at 212°F. indicate that its resistance to corrosion is of the same order as 2S and 72S. The resistance to corrosion of all Al-base alloys in water decreases rapidly with increasing water temperature, and, at 600°F., none of the Al-base alloys, commercial or experimental, has appreciable resistance to corrosion. (auth)

8862 CF-50-5-81
Oak Ridge National Lab., Tenn.
CORROSION RESISTANCE OF HOT-PRESSED AND EXTRUDED BERYLLIUM. James Reed. May 12, 1950. Decl. Feb. 20, 1956. 15p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Corrosion tests of 60 days duration were run to determine the relative corrosion resistance of hot-pressed and extruded Be exposed to distilled water at 850°C. The solution was 0.005 M in H_2O_2 and a pH range of 5.5 to 6.5 was maintained. All the Be samples were machined and/or ground in different ways so that the effect of cold working on the corrosion resistance could be studied. (auth)

8863 CF-50-6-208
[Oak Ridge National Lab., Tenn.]
CORROSION TESTS ON STELLITE L-605. James L. English. June 3, 1950. 7p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The corrosion resistance of a Co base alloy, Stellite L-605, was determined in boiling 65% HNO_3 solutions containing various concentrations of HCl and H_2O_2. The material was tested in non-welded and welded conditions under total immersion and exposure to the vapor phase. The exposure time was 312 hours and solution temperatures ranged from 110 to 120°C. The corrosion resistance of the alloy was generally poor in all cases. Welded samples showed inferior corrosion resistance to non-welded samples which may partially be attributed to improper welding techniques. The best corrosion resistance, 27.1 mils/year for totally exposed specimens, was exhibited in 65% HNO_3 containing 50% HCl. The best corrosion resistance, 12.8 mils/year, for the material exposed to the vapor phase, was also in this solution. Based on the corrosion results of this study and limitations imposed on solution contamination by the metallic constituents of the alloy, it was concluded that the use of Stellite L-605 for the intended application is not acceptable. (auth)

8864 CF-51-5-190
[Oak Ridge National Lab., Tenn.]
CORROSION NEWSLETTER NO. 3. James L. English. May 29, 1951. Decl. Feb. 7, 1956. 15p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Variations in the appearance of HNO_3-pretreated stainless steel specimens were traced to insoluble Fe compounds introduced into the bath from the treatment-vessel surface. Additional experimental data on the corrosion behavior of 347 stainless steel in 250°C UO_2SO_4 are given. (D.E.B.)

8865 CF-51-10-100
Oak Ridge National Lab., Tenn.
CORROSION NEWSLETTER NO. 6. J. L. English. Oct. 9, 1951. Decl. Feb. 9, 1956. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The vapor-phase corrosion behavior of stainless steel and the effect of oxygen exposure on pretreated stainless steel, using UO_2SO_4 at 250°C, are discussed. (W.L.H.)

8866 CF-51-11-196
[Oak Ridge National Lab., Tenn.]
CORROSION NEWSLETTER NO. 7. J. L. English. Nov. 27, 1951. Decl. Feb. 7, 1956. 34p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

Commercial grade Ti metal was extremely resistant to 1.71M UO_2SO_4 at 250°C; a weight gain of 0.01 mg/cm^2 after 227 hr was measured. A second sample gained 0.09 mg/cm^2 after 800 hr. Titanium autoclaves were used for these tests. In 0.17M $UO_2SO_4 - O_2$ pressurized systems, Ti metal gained 0.05 mg/cm^2 after 100 hr at 250°C and was slightly anodic to 347 stainless steel after 168 hr at 250°C. A corrosion rate of 0.9 mil/yr was obtained on the coupled Ti as compared to 0.2 mil/yr for the stainless steel. The corrosion rate on 347 stainless steel exposed to 0.17M UO_2SO_4 pressurized with O_2 was 0.3 mil/yr after 268 hr at 250°C. The results of a series of tests to determine variations in total U concentration at different levels in an autoclave operating at 250°C disclosed no such concentration gradients. (auth)

8867 CF-52-3-32
Oak Ridge National Lab., Tenn.
CORROSION OF 347 AND 309 SCb STAINLESS STEEL BY CONCENTRATED 1st CYCLE RAFFINATE WASTES. A. R. Olsen. Mar. 7, 1952. Decl. Feb. 7, 1956. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

8868 CF-53-9-20
Oak Ridge National Lab., Tenn.
THE CORROSION OF A CARBON STEEL CHECK VALVE BALL IN URANYL SULFATE SOLUTION. J. L. English. Sept. 2, 1953. Decl. Feb. 8, 1956. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Results of tests are presented on the rate of corrosion attack on a hardened carbon steel check valve ball in UO_2SO_4 solution. (W.L.H.)

8869 CF-55-12-77
Oak Ridge National Lab., Tenn.
THE OXIDATION OF GRAPHITAR NO. 14 BY 1.34 m URANYL SULFATE. J. C. Griess. Dec. 15, 1955. 3p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

8870 HW-29149
[Hanford Atomic Products Operation, Richland, Wash.]
COMPARISON OF DESCALING SOLUTIONS FOR ALUMINUM ALLOYS. R. S. Dalrymple. Sept. 2, 1953. 23p. Contract [W-31-109-eng-52]. $4.80(ph OTS); $2.70 (mf OTS).

A laboratory test was performed to determine if a 10% oxalic acid solution could safely be employed as a substitute to 2% chromic acid plus 5% phosphoric acid for removal of corrosion products from Al corrosion samples or slugs. Results of exposure of individual samples of 2S-H14 and 63S-T83 in the two solutions for immersion periods up to 24 hours led to the conclusions that Al alloys may be safely descaled in 2% chromic acid plus 5% phosphoric acid at 90°C for immersion periods of 30 minutes without significantly altering the surface appearance or the metal weight loss of the samples; and Al alloys are attacked by 10% oxalic acid at 85 and 90°C during an immersion time of only one minute, resulting in a change in surface appearance and a metal weight loss several times that observed in chromic-phosphoric acid solutions. (auth)

8871 HW-29727
Hanford Atomic Products Operation, Richland, Wash.
LABORATORY CORROSION TESTS OF SPRING STEEL WIRE IN SIMULATED NEUTRALIZED PUREX PROCESS WASTE SOLUTION. N. Endow. Oct. 16, 1953. 3p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80 (mf OTS).

Specimens of high strength steel wire used in the construction of pre-stressed concrete tanks are being tested in Purex process waste solution at temperatures which are expected to occur in the waste storage tanks. The results of a three-weeks exposure test indicate that no changes in tensile properties occur during exposure periods of this duration. Both the wire specimens exposed to the liquid and to the vapor were attacked slightly in places, but were not pitted to any measurable extent. Those areas which were attacked were stained with a reddish-brown corrosion product. Little weight loss was observed and the maximum corrosion rate calculated from the weight loss data, assuming uniform corrosion over the entire exposed surfaces, was approximately 4×10^{-6} inches penetration per month. This corrosion rate is of the same magnitude as the rate observed in other tests for low-carbon steel exposed to Purex process waste solution at 220 and 250°F. The one stressed specimen exposed in the three-weeks test did not show any evidence of caustic cracking, and no preferential attack was observed on any area of the specimen. (auth)

8872 HW-31744
Hanford Atomic Products Operation, Richland, Wash.
CORROSION OF TYPE 316 STAINLESS STEEL FILTER CLOTH. R. W. Wirta. May 4, 1954. Decl. Feb. 1, 1956. 6p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80 (mf OTS).

A filter stick, utilizing type 316 sintered stainless steel filter medium, is used to decant the supernatant solution from the plutonium oxalate and plutonium peroxide precipitates formed in the Isolation Building P-1 and P-2 tanks. This decanting operation serves to concentrate the process material. The supernatant solution consists of a mixture of either nitric and oxalic acids or nitric acid and hydrogen peroxide. These solutions are highly corrosive and literally disintegrate the sintered stainless steel filter in a period of two to six months. Laboratory tests have shown that a 100 x 950 twilled dutch filter cloth, woven from 0.0023-inch diameter wire, satisfactorily retains a typical plutonium oxalate precipitate. Based upon this knowledge, a filter stick utilizing this weave in type 316 stainless steel, was fabricated to evaluate particle retentivity and corrosion resistance in the process stream. (auth)

8873 HW-32734
Hanford Atomic Products Operation, Richland, Wash.
A LABORATORY STUDY OF THE EXTENT OF PITTING AND GENERAL CORROSION OF SAE-1010 STEEL IN SIMULATED NEUTRALIZED PUREX PROCESS WASTE SOLUTION. N. Endow and Kenneth L. Sanborn. Aug. 6, 1954. Decl. Feb. 20, 1956. 18p. Contract [W-31-109-Eng-52]. $3.30(ph OTS); $2.40(mf OTS).

The corrosion rates of SAE-1010 carbon steel in neutralized concentrated Purex process waste media were investigated as a function of time in laboratory corrosion tests at 220°F. In this series of tests: (a) polished coupons were exposed for periods of one, two and three months in the vapors over the simulated waste solution; (b) coupons prepared with a fine sandblasted surface were exposed for periods of one, two, three, and ten months in the vapors over the solution; and (c) coupons bearing a normal sandblasted surface were exposed for one, two, and three month periods directly in the solution. The results of these tests indicate: SAE-1010 steel exposed to vapors over neutralized Purex waste solution is subject to rather severe initial pitting attack, but that the rate of attack decreases rapidly with time. The average pitting rates after one, three and ten months exposure were 0.002, 0.0007, and 0.0004 inches per month, respectively; there is no significant difference between a polished steel surface and a fine sandblasted surface in their resistance to pitting type attack in the vapor environment; the general corrosion rates for steel exposed to the vapor, calculated on the basis that attack is uniform over the surface, are less than 0.0001 inches penetration per month for both types of steel surfaces; and that the general corrosion rates for SAE-1010 mild steel exposed in the liquid/sludge are less than 0.0001 ipm. No pitting was evident on the sandblasted surfaces and no cracks or other effects were noted. (auth)

8874 HW-33552
Hanford Atomic Products Operation, Richland, Wash.
CORROSION TEST OF MILD STEEL IN REDOX WASTE TANK. G. R. Mallett. Sept. 21, 1954. 5p. Contract [W-31-109-eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Four SAE 1020 steel samples were examined for corrosion effects after exposure to Redox waste. One sample was stressed by bending prior to exposure. Weight losses ranging from 5.2 to 8.3 mg/gm and surface pits 0.8 to 2.8 mils deep were observed. The stressed sample revealed no evidence of stress corrosion. (D.E.B.)

8875 HW-39748
Hanford Atomic Products Operation, Richland, Wash.
PROGRESS REPORT. I. ELECTRON MICROSCOPE STUDIES OF HIGH TEMPERATURE WATER CORROSION PRODUCTS. R. Borasky and B. Mastel. Sept. 1955. 11p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Electronoscopic observations were made of seamless steel boiler tubing which was autoclaved at 310°C for varying periods of time. The purpose was to determine the characteristics and distribution of corrosion products and changes in the surface microstructure of the steel tubing after autoclaving at 310°C for 17, 111, 193, and 465 hours, respectively. (auth)

8876 KAPL-197
Knolls Atomic Power Lab., Schenectady, N. Y.
REPORT ON SODIUM RESISTANT BRAZING ALLOYS. J. P. Frandsen and R. S. Zeno. June 30, 1949. Decl. Aug. 26, 1952. 17p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

An investigation was made on the effect of Na corrosion on the mechanical properties of brazed Type 347 stainless steel. Brazes of Ni–Mn, Ni–Mo, Ni–P, and Fe–P were exposed to Na at a temperature of 500°C. for a period of two weeks. It was found that none of the brazes were attacked by Na. On the basis of shear strength alone the Ni–Mn braze was found preferable, followed by Ni–Mo, Fe–P, and Ni–P in that order. (auth)

8877 KAPL-M-NGN-1
Knolls Atomic Power Lab., Schenectady, N. Y.
DYNAMIC CORROSION TEST OF TYPE-347 STAINLESS STEEL IN SODIUM. N. G. Mills and R. F. Koenig. Oct. 6, 1950. Decl. Feb. 9, 1956. 9p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

As part of the program to compare various sodium purification treatments, a six-month dynamic corrosion test employing thermal circulation was made with aged and filtered sodium to determine the corrosion and erosion resistance of type 347 stainless steel. The temperature relationships were observed for indications of plugging by metal or oxide deposition. No plugging was encountered although there appeared to be some iron deposited immediately downstream from the cooling fins and in the annulus around the specimen. The results showed that type 347 stainless steel was very resistant to corrosion and erosion in aged and filtered sodium at 500°C (932°F). It was also shown that such a system can be operated with moderate flow rates (0.3 ft/sec) and relatively small openings ($^3/_{16}$ in.) without difficulty. (auth)

Refer also to abstracts 8855 and 8957.

METALS AND METALLURGY

8878 AECD-3863
Battelle Memorial Inst., Columbus, Ohio.
WELDING OF THICK PLATES OF BUREAU OF MINES ZIRCONIUM. D. C. Martin, R. D. Williams, and C. B. Voldrich. July 31, 1950. Decl. Nov. 22, 1955. 42p. Contract W-7405-eng-92. (BMI-T-37). $0.30(OTS).

The results of this investigation show that very satisfactory weld joints can be made in Zr plates. The recommended method for the production of satisfactory joints specifies the use of the inert-gas-shielded W-arc process, He gas shielding, a controlled atmosphere, crystal-bar Zr filler, annealing, and pickling. (D.E.B.)

8879 AECD-4057
Massachusetts Inst. of Tech., Cambridge and Metal Hydrides, Inc., Beverly, Mass.
DEVELOPMENT OF A FURNACE FOR MELTING AND CASTING URANIUM METAL. Robert J. Aniceti. [nd]. Decl. Jan. 12, 1956. 7p. (M-5384). $1.80(ph OTS); $1.80(mf OTS).

The design and development of a furnace for casting U metal are described. The use of CaH_2 to increase casting yield was found to be unsuccessful but the B content was lowered through the use of the hydride. Melting in an atmosphere of A or He did not prove superior to vacuum casting. (auth)

8880 AECD-4133
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF JUNE 1947. E. J. Center, H. R. Nelson, H. A. Pray, and A. C. Richardson. June 30, 1947. Decl. Jan. 31, 1956. 15p. Contract W-38-094-eng-27. (BMI-JDS-12(27)). $3.30 (ph OTS); $2.40(mf OTS).

8881 AECD-4134
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF MAY 1947. E. J. Center, H. R. Nelson, H. A. Pray, and A. C. Richardson. May 31, 1947. Decl. Jan. 31, 1956. 29p. Contract W-38-094-eng-27. (BMI-JDS-11). $6.30 (ph OTS); $3.00(mf OTS).

8882 AECD-4135
Battelle Memorial Inst., Columbus, Ohio.
PROGRESS REPORT FOR THE MONTH OF APRIL 1947. E. J. Center, H. R. Nelson, H. A. Pray, and A. C. Richardson. Apr. 30, 1947. Decl. Jan. 27, 1956. 30p. Contract W-38-094-eng-27. (BMI-JDS-10). $4.80 (ph OTS); $2.70(mf OTS).

8883 AECD-4144
Brush Beryllium Co., Cleveland.
THE PRODUCTION OF HIGH-PURITY BERYLLIUM CARBIDE. J. G. Theodore, W. W. Beaver, A. Dolance, and A. J. Stonehouse. Oct. 15, 1952. Decl. with deletions Dec. 1, 1955. 20p. Contract AT(30-1)-541. $0.20(OTS).

A commercial method for the preparation of very pure Be_2C in quantities up to 140 pounds per run is described. This process, utilizing the reaction between −200 mesh Be powder and −325 mesh ink-grade graphite powder is carried out preferably in graphite dies under small mechanical pressures at a temperature in the neighborhood of 1000°C. The effect of variables such as stoichiometry, temperature of reaction, Be powder particle size and materials of construction are discussed. (auth)

8884 AECD-4214
Beryllium Corp., Reading, Penna.
TECHNICAL REPORT NO. 2 [ON BERYLLIUM CASTING]. Matthew J. Donachie. Nov. 16, 1949. Decl. with deletions Jan. 13, 1956. 35p. Contract AT-30-1-gen-227. $6.30(ph OTS); $3.00(mf OTS).

Vacuum-cast Be billets were inspected radiographically and approximately 70% were found to be defective. A survey was made of factors contributing to the faults. Design modifications are proposed for the vacuum furnace. General recommendations and suggestions for improvement of operations are presented. (C.H.)

8885 BBC-3
Brush Beryllium Co., Cleveland.
LUCKEY RETORT AND PRESSURE FURNACES PILOT PLANT OPERATIONS PROGRESS REPORT FOR DECEMBER 1 TO DECEMBER 31, 1947. D. T. Doll. Decl. Feb. 13, 1956. 78p. Contract W-22-075-eng-11. $12.30(ph OTS); $4.50(mf OTS).

A series of runs was made to study the production of BeF_2 by the fluorination of BeO using NH_4FHF. NH_4FHF losses and Fe pickup experienced in these runs are discussed. (D.E.B.)

8886 BBC-21
Brush Beryllium Co., Cleveland.
FIN TUBE PROJECT AND G. E. WASHER PROJECT PROGRESS REPORT FOR THE PERIOD JULY 1 TO JULY 31, 1948. D. T. Doll. Decl. Feb. 7, 1956. 13p. Contract AT-30-1-Gen-155. $3.30(ph OTS).

Progress in the development of powder metallurgy techniques for fabricating finned Be tubes is reported. (D.E.B.)

8887 BBC-31
Brush Beryllium Co., Cleveland.
LUCKEY RETORT AND PRESSURE FURNACES PILOT PLANT OPERATIONS PROGRESS REPORT FOR OCTOBER 1 TO OCTOBER 31, 1948. D. T. Doll. Decl. Feb. 13, 1956. 42p. Contract W-22-075-eng-11. $7.80(ph OTS); $3.30(mf OTS).

Progress in Be production studies is reported. Six runs were made using Mg reduction of BeF_2. The run procedure and results are given. (D.E.B.)

8888 BBC-34
Brush Beryllium Co., Cleveland.
LUCKEY RETORT AND PRESSURE FURNACES PILOT PLANT OPERATIONS PROGRESS REPORT FOR NOVEMBER 1 TO NOVEMBER 30, 1948. C. G. Hoffman. Decl. Feb. 13, 1956. 35p. Contract W-22-075-eng-11. $6.30 (ph OTS); $3.00(mf OTS).

8889 BBC-38
Brush Beryllium Co., Cleveland.
LUCKEY RETORT AND PRESSURE FURNACES PILOT PLANT OPERATIONS PROGRESS REPORT FOR DECEMBER 1 TO DECEMBER 31, 1948. C. G. Hoffman. Decl. Feb. 13, 1956. 18p. Contract W-22-075-Eng-11. $3.30 (ph OTS); $2.40(mf OTS).

Five runs were made in the pressure furnace. One run was a reduction run and the other four were remelt or purification runs in which the metal is remelted with the slag of a previous run containing approximately 60% MgF_2, 40% BeF_2. The reduction run was 55% of stoichiometric with respect to Mg. Time-temperature curves of all five of the runs were made, but in the reduction run, the time for pouring was not indicated by the curve. The primary yield was 95% based on the Mg and the metal assayed 97.45%. In all 4 of the remelt or purification runs there was an improvement in the assay of the metal of from 1 to 5.5%. The time-temperature curve of one run indicated completion of the melting but the other 3 did not show a definite thermal arrest. (auth)

8890 BBC-51
Brush Beryllium Co., Cleveland.
FABRICATION OF BERYLLIUM AND ZIRCONIUM SHAPES BY POWDER METALLURGY. Progress Report [for] Period October 1, 1949 through March 31, 1950. A. J. Stonehouse and W. W. Beaver. May 11, 1950. Decl. Feb. 13, 1956. 54p. Contract AT-(30-1)-510. $0.40(OTS).

A study is reported on the powder metallurgical fabrication techniques for the production of Be and Zr shapes. (J.E.D.)

8891 CF-53-9-49
Oak Ridge National Lab., Tenn.
PROCEDURE SPECIFICATION FOR HELIARC WELDING OF AUSTENITIC SST ALLOY PIPE, TUBING AND FITTINGS FOR FABRICATION OF THE LITR IN PILE LOOP EXPERIMENT. Gibson Morris. Sept. 15, 1953. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

8892 CT-3515
[Chicago. Univ.] Metallurgical Lab.
LONG TUBE CARTRIDGE. (A Phase of P. A. N. 181-ML-55-6). Alonzo C. Rand. June 29, 1945. Decl. Feb. 14, 1956. 62p. Contract W-7401-eng-37. $10.80 (ph OTS); $3.90(mf OTS).

A satisfactory method of extruding 45-foot long tube cartridges is demonstrated. (D.E.B.)

8893 CT-3899
Chicago. Univ. Metallurgical Lab.
TECHNICAL AND EXPERIMENTAL ASPECTS OF METAL PRODUCTION ON THE MICROGRAM AND MILLIGRAM SCALE. H. L. Baumbach, S. Fried, Z. V. Jasaitis, P. L. Kirk, H. P Robinson, R. S. Rosenfels, and E. F. Westrum, Jr. May 1946. Decl. Feb. 16, 1956. 37p. Contract W-7401-eng-37. $6.30(ph OTS); $3.00(mf OTS).

The development of conditions and techniques and the probable mechanism of the successful production of micro- and milligram quantities of Pu metal are described. A study was made of the reaction of H and Pu. Density, hardness, and melting point determinations were made. Five allotropic modifications of Pu metal have been shown to exist. (F.S.)

8894 HW-34390
Hanford Atomic Products Operation, Richland, Wash.
INVESTIGATIONS ON THE MICROSTRUCTURE OF URANIUM–REPLICATION, CATHODIC VACUUM ETCHING, AND OPTICAL AND ELECTRON MICROSCOPY. T. K. Bierlein. Jan. 18, 1955. Decl. Jan. 6, 1956. Contract W-31-109-eng-52. $0.30(OTS).

Various methods and techniques applicable to the study of fine microstructural details in radioactive specimens have been investigated. Replicas obtained from an Al pressing technique or from a Faxfilm replication sequence should overcome many of the difficulties and limitations associated with the study of radioactive specimens and should offer certain advantages. The utility and quality of cathodic vacuum etching as a means for attaining a clean, etched surface are demonstrated by micrographs of a variety of non-irradiated U specimens and their replicas. (auth)

8895 HW-34496
Hanford Atomic Products Operation, Richland, Wash.
ELECTROPLATING ON ZIRCONIUM. Y. B. Katayama. Jan. 18, 1955. Decl. Feb. 9, 1956. 2p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

A two-etchant surface preparation treatment has been found which insures good adhesion between the Zr and the Ni or Cu electroplate. The etching process requires 1½ minutes. (auth)

8896 KAPL-M-HHH-1
Knolls Atomic Power Lab., Schenectady, N. Y.
A TECHNIQUE FOR PRODUCING BORON–ALUMINUM COMPACTS. Harold Hirsch. Mar. 15, 1949. Decl. Feb. 8, 1956. 16p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

A process is described whereby a brittle, non-reactive material like boron can be formed into simple shapes of high boron density by the use of a metal binder such as aluminum, copper, or lead using relatively low temperatures. The process in essence consists of blending the proper mixture of the two powders and hot pressing in a steel die at teperatures below the melting point of the binder. (auth)

8897 KAPL-M-HHW-2
Knolls Atomic Power Lab., Schenectady, N. Y.
Be THERMAL STRESS TEST. H. H. Winkler. Sept. 19, 1949. Decl. Feb. 9, 1956. 10p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Thermal stress tests were made on Be wafers in liquid Na for a period of 140 hr with $\Delta t \sim 300°F$. A sampling of the wafers were metallographed, indicating Be cracks under high thermal stress. (D.E.B.)

8898 KAPL-M-KJK-1
Knolls Atomic Power Lab., Schenectady, N. Y.
ELECTROLYTIC POLISHING OF TRANSVERSE SECTIONS OF TYPE-347 STAINLESS STEEL TUBING. K. J. Krystyan. Nov. 21, 1951. 7p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

Experiments are discussed which indicate that a 70% H_3PO_4–10% H_2CrO_4–20% H_2O electrolyte gives the best results in polishing stainless steel. (D.E.B.)

8899 MIT-1107
Massachusetts Inst. of Tech. Cambridge.
EFFECTS OF FAST NEUTRON IRRADIATION ON ORDER-DISORDER IN NICKEL–MANGANESE ALLOYS. L. R. Aronin. Apr. 28, 1953. Decl. Dec. 8, 1955. 61p. Contract AT(30-1)-981. $0.40(OTS).

Effects of fast neutron irradiation in a Hanford reactor on order-disorder in a series of nickel–manganese alloys ranging from 16.5 to 31.9 at. % Mn were studied by resistivity and magnetic induction measurements. Attainment of an "irradiated state" differing from either cold work or

thermal disordering is suggested by comparison of exposure results on initially cold work disordered and initially thermally disordered alloys at the Ni_3Mn composition. In a region from 16.5 to approximately 22% Mn, properties of thermally disordered alloys are markedly affected by irradiation. These effects also appear to be superposed on the disordering produced by irradiation of initially ordered alloys. From theoretical exponential dependence on period of irradiation, fast neutron disordering of Ni_3Mn is determined by relating the order parameter quadratically with resistivity and linearly with magnetic induction. Under conditions of the irradiation it is estimated that each lattice site undergoes, on the average, one atomic replacement when the thermal component of integrated flux reaches 2×10^{20} n/cm^2. This leads to a figure of 5000 for the ratio of the number of atomic replacements to the number of primary collisions with neutrons of energy in excess of 0.5 Mev—subject, however, to uncertainty arising from estimation of the fast flux. As a corollary, axial attenuation of fast flux indicent upon specimens irradiated in a process tube between adjacent uranium slugs is measured. (auth)

8900 NYOO-60
Foote Mineral Co., Philadelphia.
LOW-HAFNIUM ZIRCONIUM PROJECT TECHNICAL REPORT NO. 1. Progress Report for March 1 to May 14, 1949. S. C. Ogburn and H. M. Fisher. May 18, 1949. Decl. Jan. 11, 1956. 11p. Contract AT(30-1)-543. $3.30(ph OTS); $2.40(mf OTS).

Six batches of $ZrCl_4-POCl_3$ complex have been made with relatively little difficulty, and four fractional distillations run in a 50 plate, 1-inch diameter Oldershaw glass column. Only one distillation gave a residue containing less than 0.1% HF ratio; this was with 40% total distillate fraction taken at an average rate of 1.66 grams per minute. Faster take-off rates, even with greater total distillate fractions in the other runs gave residues containing 0.18% to 0.57% Hf ratio. No entirely satisfactory method has yet been found for the decomposition of the complex, but work is continuing. (auth)

8901 NYOO-67
Foote Mineral Co., Philadelphia.
LOW-HAFNIUM ZIRCONIUM PROJECT PROGRESS REPORT FOR MAY 15 TO JULY 15, 1949. S. C. Ogburn, Jr., and H. M. Fisher. July 18, 1949. Decl. Jan. 11, 1956. 17p. Contract AT(30-1)-543. $3.30(ph OTS); $2.40(mf OTS).

Additional data have been developed which confirm the operating conditions to reduce the HF content of $ZrCl_4-POCl_3$ complex from about 3.0 to less than 0.1 Hf/Zr × 100. The decomposition of distilled complex to ZnO_2 by absolute methyl alcohol, water and ammonia has been satisfactorily accomplished on an analytical scale and on a 100 to 200 gram scale. A 1200 gram batch presented some difficulties, which should be overcome by more study on operational details, as the method is considered chemically sound. (auth)

8902 RMO-2020
International Minerals and Chemical Corp., Chicago.
URANIUM PRODUCTION PROCESS DESIGNS FOR LEACHED ZONE PLANTS. VOLUME XIV. SUMMARY OF ECONOMICS FOR THREE PROCESS ALTERNATES. R. F. McCullough and E. E. Wrege. Nov. 1953. Decl. Oct. 27, 1955. 148p. Contract AT(49-1)-545. (IMCC-2040). $30.30(ph OTS); $8.70(mf OTS).

Included is a summary of basic design data and economic studies for three process alternates for recovering between 100 and 450 tons of U per year from leached zone material. (D.E.B.)

8903 SC-3734(M)
Sandia Corp., Albuquerque, N. Mex.
INVESTMENT CASTING CONFERENCE. J. L. Abbott, C. H. Chisholm, J. B. Price, W. A. Dubovick, C. Yaker, and B. W. Duncan. Apr. 4, 1955. 58p. $9.30(ph OTS); $3.60(mf OTS).

Talks presented at the American Society of Metals meeting are given. (D.E.B.)

8904 TID-5274
Sylvania Electric Products, Inc. Atomic Energy Div., Bayside, N. Y.
EVALUATION OF HORIZONS, INC. Th METAL POWDER. Progress Report No. 1 for February 18, 1954–March 4, 1954. R. B. Wagner. Mar. 9, 1954. Decl. Jan. 13, 1956. 12p. Contract AT-30-1-gen-366. (DCF-4689). $0.15 (OTS).

Evaluation of three thorium powders from Horizons, Inc., Cleveland, Ohio, are made. Cold compacting, transverse rupture, sintering, and hot-pressing characteristics are reported. (D.E.B.)

PHYSICS

8905 AECU-3207
Sandia Corp., Albuquerque, N. Mex.
FORMULAS PERTAINING TO WEAK-SHOCKS. O. G. Owens. Dec. 20, 1954. 20p. (TM-275-54-51). $3.30 (ph OTS); $2.40(mf OTS).

Certain solutions of the cylindrical wave-equation, such as the Possio integral, which are needed in the investigation of 2-dimensional weak-shocks are determined. (auth)

8906 AECU-3209
Sandia Corp., Albuquerque, N. Mex.
HIGHER HARMONICS OF RADIAL VIBRATIONS IN SHORT HOLLOW CYLINDERS OF BARIUM TITANATE. C. V. Stephenson. Mar. 9, 1955. 6p. (TM-34-55-51). $1.80 (ph OTS); $1.80(mf OTS).

8907 AECU-3212
Sandia Corp., Albuquerque, N. Mex.
LOW SPEED WIND TUNNEL TESTS OF SEVERAL AIRFOIL SECTIONS THROUGH 360° ANGLE OF ATTACK. James F. Reed. Oct. 14, 1954. 52p. (TM-233-54-51). $13.80(ph OTS); $4.80(mf OTS).

A series of two-dimensional airfoils were run through a complete 360° angle of attack range to determine their low-speed force characteristics. The airfoils were chosen in an attempt to vary as many parameters (such as thickness, camber, thickness distribution, etc.) as possible with the limited number of shapes that time permitted. All airfoils tested had lift curves with two distinct stalls and quite similar drag curves between 0 and 90° angle of attack. The highly cambered sections developed peculiar characteristics in the inverted and trailing edge forward positions, as might be expected. The effective test Reynolds number was 0.81×10^6 based on the model chord of one foot. (auth)

8908 CF-54-8-10(Del.)
Oak Ridge National Lab., Tenn.
MEASUREMENT OF THE DENSITY OF LIQUID RUBIDIUM. S. I. Cohen and T. N. Jones. Aug. 4, 1954. Decl. with deletions Mar. 26, 1956. 4p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Density measurements made on liquid Rb metal show that the density is given by the equation ρ (gm/ml) = 1.52 – 0.00054(T – 39°C). The determinations were made using the buoyancy principle for a solid suspended in a liquid. (B.J.H.)

8909 CF-55-12-98
Oak Ridge National Lab., Tenn.
COMPARISON OF VARIOUS METHODS OF ThO_2 PARTICLE SIZE DETERMINATION. D. G. Thomas. Dec. 19, 1955. Decl. Feb. 20, 1956. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Either sedimentation or election micrograph analysis can be used to determine the apparent particle size for use in interpreting the sedimentation properties, the abrasiveness, and the mechanical damage of ThO_2 particles. Either N absorption or x-ray scattering can be used to evaluate preparation procedures because these tests give a measure of the ultimate particle size to be expected upon prolonged mechanical action and possibly upon the action of radiation. (auth)

8910 HW-31650
Hanford Atomic Products Operation, Richland, Wash.
DEVELOPMENTS NECESSARY FOR GENERAL THEORIES OF CREEP USEFUL IN STRESS ANALYSIS. K. R. Merckx. Mar. 21, 1954. 16p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40(mf OTS).

The theory of plastic deformations and the theory of plastic flow are extended to cover the dependence of strain upon stress, temperature, and time. It is hoped that the formulation of these two theories may suggest modifications in creep theory. (B.J.H.)

8911 HW-36863
Hanford Atomic Products Operation, Richland, Wash.
GENERAL CONCEPTS OF MECHANICS AND THEIR RELATION TO THERMAL STRESSES. Kenneth R. Merckx. May 24, 1955. 14p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Simple models are analyzed to demonstrate the importance of different material effects on predicted material behavior. The effects of stress, strain, and energy on the interpretation of the effects of thermal gradients are given for an understanding of basic assumptions in stress analysis. By describing material behavior in terms of energy a new approach to the study of material behavior is warranted. (F.S.)

8912 KAPL-M-RBM-1
Knolls Atomic Power Lab., Schenectady, N. Y.
APPROXIMATE SELECTION OF MECHANICAL FUSES. R. B. McCalley. Nov. 1, 1955. 18p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40(mf OTS).

The simplified theory developed herein is applicable to those cases in which the equipment to be protected has a lower frequency and a lower weight than the base on which it is mounted. While several crude approximations were made in the analysis, the results are still believed to be of aid in preliminary selection of fuses. Confirmation of the design by analysis on an analog computer with non-linear circuitry would be advisable in doubtful cases. (auth)

AEROSOLS

8913 HW-39854
[Hanford Atomic Products Operation, Richland, Wash.]
ELECTROSTATIC PROPERTIES OF AEROSOLS AND FILTER MATS—A REVIEW. J. W. Baum. Oct. 1955. 15p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40(mf OTS).

Available literature on the electrostatic properties of aerosols and filter mats was reviewed and is summarized. Topics considered are: mechanisms of aerosol and fiber electrification, electrification and particle charge in electrostatic filter mats, and instruments useful in investigating these phenomena. (D.E.B.)

ELECTRONS

8914 CP-3082
[Chicago Univ. Metallurgical Lab.]
THE STOPPING POWER OF METALS. M. L. Goldberger. July 2, 1945. Decl. Feb. 15, 1956. 22p. Contract W-7401-eng-37. $4.80(ph OTS); $2.70(mf OTS).

The effect of the conduction electrons on the stopping power of metals has been considered from two essentially different points of view. No numerical calculations have been carried out, because no way of computing Z′ e the effective charge on the moving ion, was found. An estimate made on the basis of the Thomas-Fermi atomic model indicated that Z′ 2/E is roughly constant. With this constant the stopping power of the conduction electron is found to be of the same order of magnitude as the stopping power due to bound electron excitation, and is important for the greater part of the range of the particle. (F.S.)

GASES

8915 CP-2883
[Chicago. Univ. Metallurgical Lab.]
SOLUBILITY AND DIFFUSION CONSTANTS FOR GASES. Richard Schlegel. Apr. 9, 1945. Decl. Feb. 15, 1956. 16p. Contract W-7401-eng-37. $3.30(ph OTS); $2.40 (mf OTS).

The solubility constants are presented for He, Kr, Xe, O_2, N_2, and air in H_2O. Inter-diffusion constants for gases and the diffusion of gases in H_2O are discussed. (W.L.H.)

8916 HW-28917
Hanford Atomic Products Operation, Richland, Wash.
DIFFUSION OF STACK GASES IN VERY STABLE ATMOSPHERES: CASE II. M. L. Barad and B. Shorr. Aug. 10, 1953. 11p. Contract W-31-109-eng-52. $3.30(ph OTS); $2.40(mf OTS).

Numerical calculations were made of the solutions to the diffusion equation for the case where the vertical diffusion coefficient is equal to zero. Complete results are given in graphical form. (B.J.H.)

INSTRUMENTS

8917 AECD-3974
Du Pont de Nemours (E. I.) & Co. Savannah River Lab., Augusta, Ga.
UNDERWATER MICROSCOPE FOR EXAMINATION OF SAVANNAH FUEL SLUGS. D. D. Friel. June 1953. Decl. with deletions Dec. 22, 1955. 13p. Contract AT(07-2)-1. $0.15(OTS).

A design for a practical binocular underwater microscope capable of unity and 15-power magnification has been developed for inspection of fuel slugs at Savannah River. Optimum design characteristics have been determined, and the need for non-browning glass has been established. (auth)

8918 AECU-3205
Sandia Corp., Albuquerque, N. Mex.
INVESTIGATION OF A HIGH CURRENT SWITCH TUBE. R. O. Judkins. July 20, 1955. 19p. (TM-157-55-51). $3.30(ph OTS); $2.40(mf OTS).

A gaseous discharge switch tube having an inductance of the order of 5 millimicrohenrys and jitter of 5 millimicroseconds was constructed and tested. Several modes of triggering were investigated, principally an r-f plasma electron source and a high field emission electron source. The high field emission mode operated particularly well and some jitter and delay measurements were made with it. A cur-

rent viewing resistor was constructed to observe the waveform, and the inductance of the switch and associated circuit determined. Efforts to increase the stand-off voltage which is now around 15 kv are being made. For microsecond pluses the current limits are over 300 ka and appear not to be limited by the switch tube. Work is being continued on a new model of coaxial design. (auth)

8919 CF-53-1-248
Oak Ridge National Lab., Tenn.
REMARKS ON THE FALLING BALL VISCOMETER. R. F. Redmond and S. I. Kaplan. Jan. 14, 1953. 20p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

An analysis of the method, an error analysis, and some experimental results are reported on the falling ball viscometer which measures the viscosity of fuse tures. (F.S.)

8920 HW-29317
Hanford Atomic Products Operation, Richland, Wash.
FUNCTIONAL TESTING AND OPERATING MANUAL FOR CONSOLIDATED HELIUM LEAK DETECTOR, MODEL 24-101A. H. G. Spencer. Sept. 11, 1953. 14p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40(mf OTS).

A pile gas leak detection system consisting of a mass spectrographic type of He detector, a long sampling line for use in remote or relatively inaccessible locations, a pump to pull a continuous sample of gas from the tip of the probe to the detector, and a rotameter to measure the gas flow rate in the sampling line has been developed, calibrated, and operationally tested. The system is practical for use in locating all pile gas leaks larger than about 0.1 cubic foot per hour. The calibration data permit the calculation of the size of a leak, when located, with an accuracy ordinarily sufficient for practical use for Hanford Pile leak repairing. Approximately thirty minutes is required to check the top of a Hanford Pile for leaks. Under certain conditions, the front face of a Hanford Pile can be checked in two to three hours. (auth)

8921 KAPL-M-DJR-1
Knolls Atomic Power Lab., Schenectady, N. Y.
TENSILE TESTING FACILITY AT RADIOACTIVE MATERIALS LABORATORY. D. J. Ruggiero. May 10, 1955. 13p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40 (mf OTS).

A remotely operable tensile testing machine has been put into use at the Radioactive Materials Laboratory. The tensile tester is a special design of the Radioactive Materials Laboratory, and was built by Tinus Olsen Company. This machine incorporates the essentials to produce a tensile test with a high degree of accuracy when used under remote conditions. (auth)

ISOTOPE SEPARATION

8922 ANL-5204
Argonne National Lab., Lemont, Ill.
LOW TEMPERATURE DISTILLATION OF HYDROGEN ISOTOPES. B. M. Abraham and H. E. Flotow. Dec. 1953. Decl. Dec. 5, 1955. 10p. Contract W-31-109-eng-38. $0.15(OTS).

In low-temperature distillation of T, the distillation column must dissipate the heat generated by the β decay. It consists of a double Dewar cryostat, a glass distillation column, and a vacuum line. The external Dewar contained N_2 and the inner, liquid H_2. A manometer measured the pressure in the still. A mixture of 17 at. % H and 83 at. % D was distilled, with the changing pressure indicating changing isotopic composition. Tabulated results show that 99.7% pure D_2 can be obtained. (F.S.)

MASS SPECTROGRAPHY

8923 KAPL-M-JCS-1
Knolls Atomic Power Lab., Schenectady, N. Y.
A SIMPLE ELECTROMETER CIRCUIT. J. C. Sheffield. Oct. 2, 1953. 9p. Contract W-31-109-eng-52. $1.80 (ph OTS); $1.80(mf OTS).

A simple, portable electrometer has been developed to measure direct currents in the range of 10^{-6} to 10^{-14} amperes. The output may be indicated on any stable millivoltmeter such as the Millivac Type MV-17B. (auth)

MATHEMATICS

8924 AECU-3210
Sandia Corp., Albuquerque, N. Mex.
FREQUENCY COMPONENTS OF A STEP FUNCTION AND A SINUSOID. R. M. McGehee. May 10, 1955. 29p. (TM-73-55-54). $4.80(ph OTS); $2.70(mf OTS).

Fourier analyses are made on two functions. The first is a step function formed from periodic samples of a sinusoid. If the frequency of the sinusoid is less than one-half of the sampling frequency, it is shown that the step function has no frequency components less than one-half of the sampling frequency other than that of the sinusoid itself. The second function is a sinusoid which has variable period, phase, and duration with respect to the interval of the analysis. It is shown that the insertion of a blank space in the period of analysis reduces greatly the uncertainty of the amplitude of the initial sinusoid as estimated from the results of the Fourier analysis. The results of the analyses are useful in the design and evaluation of certain analog data-analyzing systems. (auth)

8925 AECU-3211
Sandia Corp., Albuquerque, N. Mex.
A NUMERICAL INTEGRATION SCHEME FOR PROBLEMS INVOLVING CONTOUR REPRESENTATIONS. C. C. Hudson. July 6, 1955. 16p. (TM-138-55-51). $3.30 (ph OTS); $2.40(mf OTS).

The definition of the Lebesgue integral is used to develop a numerical integration method in which the integral is evaluated directly from a contour plot of the function. It is useful in working from weather maps, potential surfaces, etc., but was particularly designed to assist in reducing blast diffraction space-time diagrams to simple, meaningful quantities. (auth)

8926 CF-55-5-149
Oak Ridge National Lab., Tenn.
CALCULATION OF THE VOLUME OF LIQUID CONTAINED IN A PARTIALLY-FILLED RIGHT CIRCULAR CYLINDER INCLINED TO THE HORIZONTAL. M. Tobias. May 19, 1955. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

8927 CF-55-10-95
Oak Ridge National Lab., Tenn.
SOME INVERSE CHARACTERISTIC VALUE PROBLEMS WHICH ARISE IN THE STUDY OF SIMPLE MOLECULES. A. C. Downing and A. S. Householder. Oct. 20, 1955. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The numerical solution to certain matrix problems which are inverses of the familiar characteristic value problem is discussed. (D.E.B.)

8928 HW-33596
Hanford Atomic Products Operation, Richland, Wash.
TEMPERATURE DISTRIBUTIONS FOR FLAT PLATES AND STRIPS. Kenneth R. Merckx. Oct. 29, 1954. 12p. Contract [W-31-109-eng-52]. $3.30(ph OTS); $2.40 (mf OTS).

Equations are developed for the temperature distributions in infinite flat plates and strips with uniform heat generation. (B.J.H.)

8929 KAPL-M-LD-1
Knolls Atomic Power Lab., Schenectady, N. Y.
FORCED TRANSIENT VIBRATIONS OF A SINGLE DEGREE OF FREEDOM SYSTEM AS AN APPROXIMATION TO SHOCK LOADING. Lorenzo Deagle. Jan. 12, 1955. 18p. Contract W-31-109-Eng-52. $3.30(ph OTS); $2.40 (mf OTS).

The behavior of some real systems, under shock loading, may be approximated by the bahvior of a single degree of freedom spring-mass system subjected to a force, varying sinusoidally with time. The standard texts on vibrations treat the steady-state vibrations of such systems; however, for shock loading the transient behavior, and not the steady state, is of interest. The transient problem is treated for various pulse shapes including the sinusoidal for a one degree of freedom undamped system. An analysis is presented of the behavior of a damped single degree of freedom system acted on by a half wave of a sinusoidal pulse and the behavior of an undamped system for 1, 2, and 3 half sine waves of disturbing force. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

8930 CP-1626
Clinton Labs., Oak Ridge, Tenn.
DETERMINATION OF NEUTRON DENSITY WITH BISMUTH FOILS. Final Report — Problem Assignment 131-X21P. L. F. Curtiss. May 30, 1944. Decl. Feb. 14, 1956. Addendum. Aug. 8, 1944. 21p. (A-2295). $4.80(ph OTS); $2.70(mf OTS).

The advantages of using Bi, an α emitter after neutron activation and β decay, in pile neutron flux measurements are discussed. Techniques for preparing and counting Bi foils are described. (D.E.B.)

8931 M-1327
Clinton Labs., Oak Ridge, Tenn.
G. M. COUNTER READINGS VS. LAURITSEN ELECTROSCOPE READINGS. K. Z. Morgan and John Healy. Mar. 8, 1944. Decl. Feb. 14, 1956. 9p. $1.80(ph OTS); $1.80(mf OTS).

The responses of G. M. counters and Lauritsen electroscopes to a standard Ra source, shielded and unshielded, are compared. (D.E.B.)

MOLECULAR PROPERTIES

8932 AECD-4187
Tennessee Eastman Corp., Oak Ridge, Tenn.
DETERMINATION OF THE MOLECULAR WEIGHT OF "TUBALLOY PENTACHLORIDE" [UCl_5]. H. L. Goren, R. S. Lowrie, and J. V. Hubbard. Feb. 28, 1946. Decl. Feb. 15, 1956. 10p. Contract W-7401-eng-23. (C-5.350.8). $1.80(ph OTS); $1.80(mf OTS).

Carbon tetrachloride was used in the boiling point procedure to determine the molecular weight of the salt previously assumed to be UCl_5. The rise in boiling point of CCl_4 corresponded most closely to the presence of a dimer of UCl_5 ($UCl_5 \cdot UCl_5$ or $UCl_4 \cdot UCl_6$). Results of the x-ray-diffraction analysis would be necessary to identify the compound positively. (auth)

NEUTRONS

8933 AECD-4220
Knolls Atomic Power Lab., Schenectady, N. Y.
NOTES ON PREDICTED FAST NEUTRON DOSE FROM THERMAL NEUTRON DATA IN WATER. Henry E. Stone. Mar. 9, 1953. Decl. Feb. 8, 1956. 29p. Contract W-31-109-Eng-52. (MEMO-HES-9). $4.80(ph OTS); $2.70 (mf OTS).

An approximate method has been applied to predict fast neutron dosimeter data from thermal neutron measurements. Results are compared with actual dosimeter data and it is concluded that the method presented gives a good approximation for fast neutron dose. This is important since in many previous experiments fast neutron dosimeter data had not been taken, but thermal neutron data had been obtained. (auth)

8934 CF-55-5-2
Oak Ridge National Lab., Tenn.
ANALYSIS OF THE CONSTANT VELOCITY TRANSPORT EQUATION WITH THE AID OF EIGENFUNCTIONS OF THE VARIOUS MEDIA. F. H. Murray. May 5, 1955. 20p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The analysis presented is developed especially for the calculation of neutron flux in stratified media from the constant velocity transport equation. Solutions of this equation with no source distributions present are constructed for cylindrical and spherical geometries from solutions for plane symmetry, in which the flux varies with one plane coordinate only. The formulas obtained are designed to be applicable to flux calculations for solids made up of cylindrical and spherical shells of various materials. (B.J.H.)

8935 CF-55-9-168(Rev.)
Oak Ridge National Lab., Tenn.
THE CALCULATION OF NEUTRON RADIATIVE CROSS-SECTIONS OF NUCLEI. Lawrence Dresner. Nov. 3, 1955. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The derivation of the Wigner equation for the radiative capture cross-section was reviewed and its relation to an exact expression was examined, and the exact expression was compared with the experimental radiative capture cross section for U^{238}. (F.S.)

NUCLEAR PHYSICS

8936 CF-2773
[Chicago. Univ. Metallurgical Lab.]
CALORIMETRIC DETERMINATION OF PRODUCT-POWER RATIO AND OF FISSION ENERGY. Donald Engelkemier and D. L. Hill. Mar. 15, 1945. Decl. Feb. 16, 1956. 16p. Contract W-7401-eng-37. $3.30(ph OTS); $2.40(mf OTS).

Four new U lumps containing thermocouples were given intense short-period irradiations in the Argonne graphite pile, and the thermal energy developed in each observed by the thermocouple potentials. The amount of Pu^{239} produced in the first two was determined by chemical extractions, and indicated the production of $(3.9 \pm 0.3) \times 10^{-5}$ grams Pu^{239} kwh. The amount of 12.5 day Ba in the last two lumps was determined, and assuming its yield to be 6.13%, the energy per fission was found to be 199 ± 16 Mev. (auth)

8937 HW-31883
Hanford Atomic Products Operation, Richland, Wash.
HEAVILY FILTERED X-RAYS. H. V. Larson. June 26, 1954. 4p. Contract [W-31-109-eng-52]. $1.80 (ph OTS); $1.80(mf OTS).

Heavily filtered x rays were produced using Cu and Pb absorbing media. The Cu filtered x rays cover an energy range from 0.052 to 0.062 Mev and the Pb filtered x rays an energy range from 0.15 to 0.20 Mev. The dose rates available are shown. The principal advantages of the filtered x ray sources over the fluorescent source are that they cover an energy range unattainable by the K fluorescent

source (0.15 to 0.20 Mev) and provide much larger dose rates. (auth)

NUCLEAR PROPERTIES

8938 AECD-4226
Knolls Atomic Power Lab., Schenectady, N. Y.
SELF-SHIELDING MEASUREMENTS IN PPA-20. J. S. King. Sept. 9, 1954. Decl. Feb. 8, 1956. 51p. Contract W-31-109-eng-52. (MEMO-JSK-4). $7.80(ph OTS); $3.30(mf OTS).

The self-shielding characteristics of a number of absorbers and of U^{235} and U^{238} have been investigated in PPA-20 (66°). Most of the measurements have been made in ring 3 at the core mid-plane. The foil doubling technique was employed. Particular attention was given to "thin" foil regions for the purpose of extrapolating the data to zero thickness. In a few cases, namely Au, Ag, Cd, and B, theoretical self-shielding curves have been calculated and found to be in good agreement with the experimental data. Both reactivity coefficient and activation experiments were undertaken for Au for the purpose of evaluating changes in F_L with self-shielding. In a number of cases the zero-width reactivity coefficient has been calculated and compared with the extrapolated data. (auth)

8939 IDO-16276
Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
TOTAL NEUTRON CROSS SECTIONS OF SODIUM, POTASSIUM, AND RUBIDIUM IN THE 0.03 TO 10 EV REGION. E. G. Joki, L. G. Miller, and J. E. Evans. Apr. 22, 1955. Contract AT(10-1)-205. (PPC-149). $3.30(ph OTS); $2.40(mf OTS).

Transmission measurements were made with the MTR crystal spectrometer on Na, K, and Rb metal samples 8.73 cm (8.48 g/cm^2), 30.0 cm (26.1 g/cm^2) and 5.04 cm, respectively. The free atom scattering cross sections, as determined from these data, are 3.2 ± 0.1 b for Na, and 2.04 ± 0.1 b for K. The Rb data are to be corrected for a 5 wt. % Cs contamination in the sample. (auth)

NUCLEAR REACTORS

8940 AECD-3822
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
NEUTRON FLUX DISTRIBUTIONS IN MULTIPLE REGION REACTORS. S. Wallach. Dec. 1951. Decl. with deletions Dec. 6, 1955. 64p. Contract AT-11-1-GEN-14. $0.40 (OTS).

The problem of determining neutron flux distributions in reactors consisting of discrete regions of substantially different nuclear properties is considered. Starting with the steady state two-group diffusion equations the problem is considered of determining the flux in one of the energy groups given the spatial flux distribution of the next higher energy group. The problem is handled by converting the differential equation with source term to an integral equation; under appropriate conditions the integral equation may be solved by a numerical iterative procedure. The conditions under which this may be done are discussed and formulas are developed for placing bounds on the errors. In addition the technique of obtaining flux distributions in complicated configurations by additive and multiplicative superposition of flux distributions of simpler configurations is considered. Expressions are derived for estimating the errors made in using these methods. A number of simple examples are presented. (auth)

8941 AECD-3840
Argonne National Lab., Lemont, Ill.
TRANSIENT AND STEADY STATE CHARACTERISTICS OF A BOILING REACTOR. THE BORAX EXPERIMENTS, 1953. J R. Dietrich and D. C. Layman. Feb. 1954. Decl. with deletions Dec. 9, 1955. 136p. Contract W-31-109-eng-38. $0.65(OTS).

The characteristics of transient and steady state boiling in a water-cooled, water-moderated reactor have been investigated. In a series of about 70 intentional "runaway" type tests it was demonstrated that the formation of steam and consequent ejection of water from the reactor core can provide inherent protection against the runaway hazard in suitably designed reactors of the water-cooled, water-moderated (H_2O or D_2O) type. Power excursions of periods as short as 0.005 second (2.1% excess reactivity in the experimental reactor) were terminated by this process. Although the maximum power in the excursions went as high as 2600 Mw fuel plate temperature never exceeded 640°F. Maximum power, total energy libration, and fuel plate temperatures were investigated at atmospheric pressure as functions of excess reactivity in the excursion and initial reactor temperature. Operation of the reactor in steady boiling at pressures up to 130 psig and powers up to 1200 kw demonstrated that quite smooth operation is attainable up to the point where the steam content of the reactor represents about -2% k_{eff} in reactivity. At higher steam contents characteristic power fluctuations were observed. The reactor steam power was shown to be self-regulating. The effects of various operating conditions and system variables on reactor power and operating characteristics were investigated. Results of the investigation are believed to point the way toward more economical power reactors through minimization of the hazard problem, simplification of reactor design, and reduction of the temperature demands on reactor materials. (auth)

8942 AECD-3990
Oak Ridge National Lab., Tenn.
REACTOR PHYSICS OF TEAPOT. PART III. P. R. Kasten. July 16, 1952. Decl. with deletions Nov. 29, 1955. 38p. Contract W-7405-eng-26. $6.30(ph OTS); $3.00(mf OTS).

The statics of the Teapot, a small-scale boiling reactor experiment, are considered. Power coefficients of reactivity, energy coefficients of fluid density, poisoning effects of fission products, and production of gases are treated. (auth)

8943 AECD-4020
North American Aviation, Inc., Downey, Calif.
TEMPERATURE COEFFICIENT OF REACTIVITY IN THE CONVERTER REACTOR. L. B. Robinson. Jan. 31, 1952. Decl. Jan. 13, 1956. 12p. (NAA-SR-Memo-213). $0.20 (OTS).

8944 AECD-4083
Oak Ridge National Lab., Tenn.
PRACTICAL REACTOR THEORY. J. W. Webster. Oct. 21, 1953. Decl. with deletions Dec. 1, 1955. 143p. Contract W-7405-eng-26. $0.70(OTS).

Methods are derived for calculating critical mass; power distribution; reactivity effects of temperature, depletion, and fission-product poisons; the necessary number of control rods to compensate for these effects; and the kinetic behavior of flux and temperatures in a reactor. The subjects discussed in this report are: the one-group theory for the calculation of critical mass and power distribution, the Fermi age theory for calculating critical mass, the two-group theory for calculating critical mass and power distribution, the effect of temperature, depletion, and fission-product poisons, such as Xe and Sm,

the necessary number of control rods (shim rods) to offset the virtual supercriticality that exists in a reactor at startup, and the kinetic behavior of flux and temperatures in a reactor. (auth)

8945 AECD-4095
Argonne National Lab., Lemont, Ill.
SUGGESTION FOR AN EXPERIMENTAL POWER REACTOR. AN IMPREGNATED GRAPHITE, NITROGEN-COOLED REACTOR AND GAS TURBINE, USING MATERIALS AND EQUIPMENT AVAILABLE NOW. Farrington Daniels. Apr. 1950. Decl. with deletions Dec. 13, 1955. 29p. Contract W-31-109-Eng-38. $0.25(OTS).

Factors involved in power reactors are discussed, and the requirements for different purposes are reviewed. A nitrogen-cooled reactor operating gas turbines at 1300 to 1500°F, giving 1000 kw of electricity using a $U^{235}O_2$ impregnated graphite moderator is proposed, and design specifications are given. (F.S.)

8946 AECD-4209
Knolls Atomic Power Lab., Schenectady, N. Y.
A PROPOSED AUTOMATIC CONTROL SYSTEM FOR THE SCHENECTADY REACTOR. J. I. Owens, Jr., F. E. Crever, and J. H. Pigott. Mar. 29, 1949. Decl. Dec. 9, 1955. 11p. Contract W-31-109-eng-52. (MEMO-J10-1(Rev.)). $0.15(OTS).

An automatic control system is proposed that will compensate for reactivity variations in order to maintain any desired power level necessary for a power producing reactor. Such a control would hold any predetermined power level to a much higher degree of accuracy than would be possible with manual control. The system is shown by block diagram. (auth)

8947 AECD-4229
Brookhaven National Lab., Upton, N. Y.
k_∞ IN URANIUM–WATER LATTICES. T. Auerbach. July 28, 1955. Decl. Feb. 7, 1956. 6p. Contract AT-30-2-gen-16. $1.80(ph OTS); $1.80(mf OTS).

Theoretical values of k_∞ for slightly enriched $U-H_2O$ matrices are determined and compared with available experimental values. (D.E.B.)

8948 ANL-4294
Argonne National Lab., Lemont, Ill.
NUCLEAR REACTOR SIMULATOR. J. M. Harrer. June 1, 1949. Decl. Nov. 29, 1955. 101p. Contract W-31-109-eng-38. $0.55(OTS).

A reactor simulator was designed, keeping the model similar to the physical phenomena described by the differential equations to be solved. It consists of a network of electrical conducting elements and suitable sources of current and current sinks. The design of the network is such that when the proper electrical resistance values are assembled and the current sources and sinks are properly adjusted, the steady state voltage distribution on the network is the same as the steady state voltage distribution on the network is the same as the steady state flux distribution in the reactor, and the current sources are a measure of the critical mass of the reactor. (F.S.)

8949 ANL-4481
Argonne National Lab., Lemont, Ill.
REACTOR ENGINEERING DIVISION QUARTERLY REPORT [FOR] MARCH 1, 1950 THROUGH MAY 31, 1950. W. P. Bigler. July 1, 1950. Decl. Dec. 13, 1955. 28p. Contract W-31-109-eng-38. $4.80(ph OTS); $2.70(mf OTS).

8950 BNL-158
Brookhaven National Lab., Upton, N. Y.
LEAKAGE OF GAMMA RADIATION THROUGH SPHERICAL VOIDS. William W. Pratt and H. J. Kouts. Mar. 1, 1952. Decl. Mar. 19, 1956. 19p. $3.30(ph OTS); $2.40(mf OTS).

The measurements reported here were made in the BNL water tank shielding facility. The measurements were made with a brass-walled G-M counter, shielded on all sides by $2\frac{1}{2}$ in. of Pb. The experimental arrangement is illustrated. The tank was filled with water to a depth of 143 in. An outlet is provided at the top surface of the tank, so that the water level remains constant when a void is placed in the tank. The counter was mounted 1 in. above the water surface, and measurements were made at various points in the horizontal plane. A natural U source plate $39\frac{5}{8}$ in. × $39\frac{5}{8}$ in. × $\frac{5}{8}$ in. is mounted below the tank to provide a fission source of gamma rays and neutrons. The top surface of the source plate is shielded with boral from thermal neutrons from the water tank itself. A plate of Bi $3\frac{5}{8}$ in. thick is mounted below the source plate to suppress gamma-ray leakage from the pile reflector. Even with the Bi shield in place, the fraction of the γ-ray flux at the surface of the water which is attributed to the source is only about 5% of the total flux. Thus, the γ-ray measurements are primarily characteristic of the pile γ rays and those produced by neutron capture in the material surrounding the water tank facility. (auth)

8951 CE-1439
Clinton Labs., Oak Ridge, Tenn.
HEAT GRADIENT IN THE X SHIELD. Progress Report on Problem Assignment No. 107-X6E. J. A. Lane. Apr. 29, 1944. Decl. Feb. 14, 1956. 14p. (A-2282). $3.30(ph OTS); $2.40(mf OTS).

Calculations of the temperature differences across the pile shield have been carried out by a stepwise method which assumes maximum possible temperature gradients in the pile as the first approximation. It is recommended as a result of the calculations that 20 channels adjacent to the shield be left open at the sides and top of the pile. With the new fans, these extra cooling channels, by decreasing the total air flow will lower the operating power about 1%, but will reduce to 16°C the average temperature differences across the shield, which is the limit set by the design division. (auth)

8952 CE-2567
[Clinton Labs., Oak Ridge, Tenn.]
ACTIVITY FROM BARE TUBALLOY [URANIUM] IN PILE WATER. Final Report [on] Problem Assignment 127-X18P. R. B. Briggs. Jan. 20, 1945. Decl. Feb. 27, 1956. 22p. Contract W-7405-eng-39. $4.80(ph OTS); $2.70(mf OTS).

Water activity data and equipment contamination data were taken for operation with a piece of bare U in a water tube in the ORNL Graphite Reactor. Observed activities were about 10 times the calculated activities. The end fittings were rather badly contaminated during operation and discharging. (auth)

8953 CE-2577
[Clinton Labs., Oak Ridge, Tenn.]
SPRAY COOLING OF THE "X" PILE. Final Report Problem Assignment 122-X19E. R. B. Briggs. Jan. 30, 1945. Decl. Feb. 15, 1956. 10p. Contract W-7405-eng-39. $1.80(ph OTS); $1.80(mf OTS).

Tests were run to determine the increase in power that could be obtained by spraying water into the channels in the ORNL Graphite Reactor. The absorption of water by the structure makes it appear that any increase would be less, probably much less, than 1500 kw if the present temperature limits were maintained. (auth)

8954 CF-3746
Argonne National Lab., Lemont, Ill.
PILE RESEARCH & DEVELOPMENT DIVISION REPORT FOR JULY 1946–FEBRUARY 1947. Feb. 28, 1947. Decl. Dec. 20, 1955. 74p. Contract W-31-109-eng-38. $12.30 (ph OTS); $4.50(mf OTS).

8955 CF-48-7-312
Oak Ridge National Lab., Tenn.
AIR COOLING REQUIREMENTS OF THE HIGH FLUX PILE. James A. Lane. July 13, 1948. Decl. Feb. 20, 1956. 15p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

A modification of the design of the Graphite Cooling system using an annulus of BeO spheres adjacent to the pile tank is discussed. Reduced air requirements, greater protection to the graphite from fast neutron bombardment, and elimination of the cumbersome replaceable graphite ring are the advantages of the system. (F.S.)

8956 CF-49-1-281
Oak Ridge National Lab., Tenn.
AN ESTIMATE OF THE AIR COOLING REQUIREMENTS OF THE HIGH FLUX PILE—GRAPHITE PEBBLES. R. Van Winkle. Jan. 18, 1949. Decl. Feb. 20, 1956. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

From these fairly rough calculations, the order of magnitude of gas flow and pressure drop through the reactor may be estimated at about 15,000 to 18,000 cfm and 6 to 12 inches H_2O, depending upon the pebble size chosen. Since the total air requirement is rather independent of pebble diameter, the cost of the pebble system depends more on ball fabrication costs than on power requirements. The optimum occurs at about two-inch diameter pebbles although such pebbles are too large from the standpoint of fast neutron streaming and air-channelling characteristics. A compromise between fabrication cost and the need for an adequate loading around vertical experimental holes is therefore necessary and on this basis, one-inch-diameter balls are suggested. (auth)

8957 CF-50-4-98
Oak Ridge National Lab., Tenn.
HOMOGENEOUS REACTOR CORROSION STUDIES. J. L. English. Apr. 17, 1950. Decl. Feb. 3, 1956. 12p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A resume of the results of corrosion tests with zirconium and stainless steels for the homogeneous reactor in uranyl sulfate solution at 250°C is presented. These results include data available as of April 11, 1950. Considerable emphasis during the past month has been placed on the corrosion performance of these materials over an extruded period of time. The corrosion tests have been conducted with three basic conditions, all of which use uranyl sulfate solution containing 40 gm/liter of uranium. Tests are operated at 250°C and specimens are inspected weekly for measurement of corrosion damage. The three categories of corrosion test results discussed are listed under zirconium, stainless steels, and general information. (auth)

8958 CF-50-4-115
Oak Ridge National Lab., Tenn.
THERMAL STRESSES IN HRE REFLECTOR TANK. H. C. Savage. Apr. 19, 1950. Decl. Feb. 8, 1956. 18p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Thermal stresses in the HRE reflector tank are calculated, consideration being given to geometry and temperature gradients. The influence of these stresses on tank cooling considerations is discussed. (D.E.B.)

8959 CF-50-12-104
Oak Ridge National Lab., Tenn.
HRE SHIELDING DESIGN REPORT—SUPPLEMENT. C. L. Segaser. Dec. 27, 1950. Decl. Dec. 16, 1955. 43p. Contract [W-7405-eng-26]. $0.30(OTS).

Studies were made to a supplement to CF-50-10-135 (HRE shielding design report) in which a proposed shielding structure was presented and analyzed from the standpoint of biological effectiveness. As a further precaution to reduce possible radiation hazards which may result from operation of the HRE, it is proposed to operate the shielding structure such that not less than 0.500 inches of water pressure differential between the process building and the inside of the shielding will be maintained. Thus, if there is any leakage from the high-pressure soup system, radioactive fission products cannot escape from the shield and contaminate the process building ambient air, but, rather will be discharged through a duct and fan system along with radioactive A^{41} generated in the air surrounding the reactor and, hence, out through a 100-ft stack to be disseminated in the upper air strata. A secondary benefit will be derived from such a system in that about 12 kw of heat will be generated in the shield concrete due to the absorption of leakage gamma and neutron radiation from the pile. The ventilating air induced through the shielding structure is distributed to effectively remove this heat, which, if not removed, would result in an excessive concrete temperature. A proposed system for inducing air through the HRE shielding structure is shown. The minimum requirements for this system are that it shall be capable of inducing at least 1000 cfm through the internal structure and shall be capable of maintaining 0.500 inches of water pressure differential over the outer masonry wall. An off-set duct arrangement may possibly be provided in the outer shield wall for control of air flow in order to assure 1000 cfm minimum flow with the available head, should this prove necessary. This differential pressure induces air to filter through openings in the structure wall such as the cracks around shielding plugs, pipe openings, etc. The air is made to flow through the various compartments to the bottom of the shielding structure which, effectively, functions as a plenum chamber. From here, the aid is drawn upward through a 1 inch cooling annulus in the concrete surrounding the reactor to the main air duct which is attached to the concrete at a distance of approximately 12 ft from the operating floor level. Air is induced through the main duct by means of a variable speed fan discharging up a 100 ft stack. Since the air flowing through the duct system is radioactive, the duct to the fan and stack is to be run underground. (auth)

8960 CF-51-1-97
[Oak Ridge National Lab., Tenn.]
EXPERIMENTAL PROGRAM FOR THE HRE. L. R. Quarles. Jan. 30, 1951. Decl. Feb. 7, 1956. 17p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A logical experimental program containing sub-critical, critical, low flux, and high flux tests is outlined. This program is expected to yield a maximum of experimental data without costly program revisions. (D.E.B.)

8961 CF-51-5-199
Oak Ridge National Lab., Tenn.
THE UNCOLLIDED FLUX IN A STRAIGHT CYLINDRICAL DUCT. E. P. Blizard. May 18, 1951. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A mathematical analysis is given for the uncollided flux in a straight cylindrical duct. (F.S.)

8962 CF-51-7-114
Oak Ridge National Lab., Tenn.
CALCULATION OF FLUID FRICTION COEFFICIENTS IN THE PRESSURIZER TUBE AND THEIR EFFECTS ON THE REACTIVITY OF THE CORE MATERIALS. R. E. Aven. July 25, 1951. Decl. Feb. 7, 1956. 7p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Changes in reactor core density are caused by reactor temperature changes, and are essential for stability. These changes are actually accomplished by the flow of core liquid into or out of the pressurizer, and it is necessary to know the natural frequency and damping coefficient of the resulting pressurizer oscillations. The frequency is 24 cycles/

second at 500°F and 31 cycles/second at 400°F. By the use of a modified form of the Fanning Equation for the turbulent flow region and a modification of Poiseuille's law for the streamline flow region, it is possible to estimate, with a fair degree of accuracy, the friction decay coefficient of the mechanical oscillation. This coefficient can then be used to determine the behavior of the pressurizer oscillations when coupled to the nuclear energy production. (auth)

8963 CF-51-8-48
Oak Ridge National Lab., Tenn.
SUPPLEMENT TO CF-51-5-12, CALCULATIONS ON THE HRE EMERGENCY COOLING SYSTEM. R. H. Chapman. Aug. 6, 1951. Decl. Feb. 7, 1956. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A recalculation was made of the operating temperatures of the natural convection cooling system based on the heat dissipated by Series 38 finned tubes. (B.J.H.)

8964 CF-51-10-33
Oak Ridge National Lab., Tenn.
ACTIVITIES IN D_2O IN REFLECTOR VESSEL. L. Cooper. Oct. 3, 1951. Decl. Feb. 6, 1956. 10p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Calculations were made to determine the level of radiation in the D_2O in the reflector vessel caused by formation of active atoms from dissolved salts, corrosion products and metal recoils. The important elements, from the point of view of high activity and appreciable half-life are Na^{24}, Mn^{56}, Fe^{55}, and Fe^{59}. The calculations indicate activities as high as 5 curies 10 days after shutdown. Plots of activity as a function of time after shutdown are given. (auth)

8965 CF-52-1-77
Oak Ridge National Lab., Tenn.
MECHANICAL STABILITY CONSIDERATIONS IN THE DESIGN OF PRESSURIZERS FOR LARGE HOMOGENEOUS REACTORS. R. E. Aven. Jan. 11, 1952. Decl. Feb. 6, 1956. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The build-up of mechanical oscillations in intermediate and large homogeneous reactors can place limits on pressurizer dimensions. Equations are developed for evaluating these limits. (D.E.B.)

8966 CF-52-2-20
Oak Ridge National Lab., Tenn.
SOUP VOLUME ADDITIONS ALLOWABLE IN TEAPOT REACTOR. P. R. Kasten. Feb. 4, 1952. Decl. Feb. 7, 1956. 4p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Calculations indicate no control rod will be necessary in Teapot if the fuel addition rate is below 50 to 150 ml/sec, depending on the H/U^{235} ratio. (D.E.B.)

8967 CF-52-2-78
Oak Ridge National Lab., Tenn.
ESTIMATION OF THE LIQUID TEMPERATURE IN THE CORES OF HOMOGENEOUS REACTORS. J. O. Bradfute. Feb. 12, 1952. Decl. Feb. 20, 1956. 9p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Equations are developed for evaluating the maximum fuel temperatures in a homogeneous reactor core from its parameters. (D.E.B.)

8968 CF-52-6-118
Oak Ridge National Lab., Tenn.
REACTOR PHYSICS OF TEAPOT. PART II. P. R. Kasten. June 20, 1952. Decl. Nov. 30, 1955. 18p. Contract [W-7405-eng-26]. $0.20(OTS).

The reactor physics of the Teapot, a small-scale boiling-reactor experiment is discussed, and the effect of the thimble and/or control rod on the critical mass requirements and flux distribution for various operating conditions is covered, as well as the variation of the critical material multiplication constant with rod position. (auth)

8969 CF-53-1-247
Oak Ridge National Lab., Tenn.
FEASIBILITY OF OBTAINING POWER ECONOMICALLY FROM THE MTR OPERATING AT TEMPERATURES AS HIGH AS 180°F. J. D. Maloney. Jan. 22, 1953. Decl. Feb. 8, 1956. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

A study of the MTR was made to determine the feasibility of adding a turbine plant to the present installation for the production of sufficient electric power to supply the reactor and plant site at Arco. From cost studies it appears that power could be generated economically during normal operating periods. Arrangement with the power company to supply power during shut down would be required. The cost of these arrangements may exceed any gain realized by power generation from waste heat. (F.S.)

8970 CF-53-2-112
Oak Ridge National Lab., Tenn.
BOILER REACTOR OPERATION: PART II—REACTOR GOVERNORS. P. R. Kasten. Feb. 12, 1953. Decl. Nov. 30, 1955. 12p. Contract [W-7405-eng-26]. $0.15(OTS).

Boiling reactors can be automatically regulated so as to satisfy varying power demand. A flexible control system consists of a shielded fuel reservoir maintained at constant pressure connected to the reactor core, in combination with a core-pressure-control valve which regulates the flow of steam by-passing the turbine. (auth)

8971 CF-53-4-23
Oak Ridge National Lab., Tenn.
D_2O EVAPORATOR. J. P. Sanders and P. N. Haubenreich. Apr. 6, 1953. Decl. Feb. 20, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

A unit has been designed and is presented for the evaporation of D_2O at 1000 psia and temperatures below 250°C. This unit consists of a humidification column in which D_2O is evaporated into an oxygen stream. In addition to the sensible heat of the entering liquid, heat is added to the system by recycling the liquid through a heat exchanger. Storage for approximately 750 liters of concentrated solution is provided. Exclusive of this storage, the total liquid hold-up is less than 1 cubic foot of liquid. (auth)

8972 CF-53-6-162
Oak Ridge National Lab., Tenn.
DESIGN OF ISHR CATALYTIC RECOMBINER. I. Spiewak and R. E. Aven. June 26, 1953. Decl. Feb. 9, 1956. 25p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

The recommended design is a bed $3\frac{1}{2}$ feet long and $2\frac{1}{2}$ inches thick in the form of a cylindrical annulus with inside diameter of 7 inches and an outside diameter of 12 inches. The catalyst is in the form of $\frac{1}{8} \times \frac{1}{8}$ inch cylindrical pellets made of 0.3% platinized alumina. By making a heat balance between the heat input to the pellets from the chemical recombination reaction of D_2 and O_2, and the heat output, i.e. the heat carried away by the gas stream, it was possible to predict the temperature of both the gas stream and pellet surface as a function of radius, r, of the bed. The maximum temperature calculated (451°C for normal conditions) seems to be low enough so that damage to the catalyst pellets or bed is not expected from this source. (auth)

8973 CF-53-8-77
Oak Ridge National Lab., Tenn.
DETERMINATION OF THE FEASIBILITY OF USING A YORK MESH ENTRAINMENT SEPARATOR IN THE I.S.H.R. James A. Luker. Aug. 4, 1953. Decl. Feb. 9,

1956. 29p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

The feasibility of using a York Mesh Entrainment Separator in the ISHR was studied. The effectiveness of York Mesh Packing for removing entrainment was calculated for two types of packing, i.e., 110μ diameter wire and 279.4μ diameter wire. Several particle size distribution spectra of the entrained liquid leaving the gas separator were postulated. Calculations were made to show how effectively the York Mesh Packing would remove the assumed entrainment spectra. Estimates were made also of the probable average entrainment size. The problems of flooding velocities, liquid load, and refluxing of the entrainment separator were considered. Performance charts for the York Mesh Packing are presented. The investigation led to the conclusion that York Mesh Packing will satisfactorily reduce the uranyl sulfate concentration to one part per billion in the gas phase. Recommendations were made for experimental work to study the problems of uranium accumulation in the entrainment separator, and refluxing. (auth)

8974 CF-54-4-114
Oak Ridge National Lab., Tenn.
EMERGENCY CONDENSER CALCULATIONS. C. L. Segaser. Apr. 12, 1954. Decl. Feb. 7, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Calculations were made for a condenser to dissipate heat released from radioactive decay of fission fragments in the fuel solution of the HRT following a dump to the outer fuel storage tank. (F.S.)

8975 CF-54-4-216
Oak Ridge National Lab., Tenn.
ESTIMATE OF PERFORMANCE OF HRT MAIN FUEL SOLUTION HEAT EXCHANGER IN PROPOSED HRT BLANKET LOOP. C. L. Segaser. Apr. 7, 1954. Decl. Feb. 9, 1956. 8p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Calculations have been made pertaining to the probable performance of the main heat exchanger specified for the HRT fuel solution loop if used without change as the main heat exchanger for the HRT blanket loop. These calculations were made with data taken from the HRT flowsheet and the HRT design data sheets, using methods and data reported in CF-53-12-94 and CF-54-2-72. With a flow rate of 230 gpm, an entrance temperature of 275°C and an exit temperature of 250°C, these calculations indicate that this exchanger is apparently capable of generating 5,360 lb/hr of saturated stream at 540 psia with a blanket solution pressure drop through the exchanger of 8.68 psi. To generate steam at 520 psia, results indicate that heat transfer area of only 390 ft^2 is required, or 90 ft^2 less than the actual exchanger. (auth)

8976 CF-54-5-159
Oak Ridge National Lab., Tenn.
EFFECT OF OIL CONTAMINATION ON THE BOILING HEAT TRANSFER CHARACTERISTICS OF HEAT EXCHANGERS AND SOLID FUEL-PLATE REACTORS. M. W. Rosenthal and R. L. Miller. May 19, 1954. 15p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The effect of oil contamination on the heat transfer characteristics of water boiling on solid surfaces was studied. Two types of systems are considered: the heat transfer surface is maintained at a constant temperature; the heat flux is held constant. This study was undertaken in an attempt to explain the marked reduction in heat transfer which occurred in the HRE heat exchanger in October, 1953. An experimental investigation confirmed by work reported in the literature revealed that oil can cause transition from nucleate to film boiling at a much lower value of heat flux (and corresponding temperature difference) than occurs with pure water. The results indicate the likelihood that a change in the mechanism of boiling from nucleate to film contributed to the decrease in the HRE exchanger. If film boiling were to develop on a plate of a water-cooled solid fuel element reactor (or any constant flux source) a rise in temperature of the plate of the order of 1000°F could occur with resultant damage to the system. (auth)

8977 CF-54-7-34
Oak Ridge National Lab., Tenn.
OXYGENATION OF HRT SOLUTION. Sidney Visner. July 14, 1954. Decl. Feb. 20, 1956. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

An examination of the HRT flowsheet indicates the substitution of a low-pressure O_2 injection system for the proposed high-pressure system may be both advantageous and feasible. A low-pressure system, located at the suction of the pulsafeeder pump, is proposed. (D.E.B.)

8978 CF-54-7-88(Pt. 1)
Oak Ridge National Lab., Tenn.
NOTES ON REACTOR ANALYSIS. PART I. ELEMENTARY SURVEY. D. K. Holmes and R. V. Meghreblian. Aug. 5, 1955. 97p. Contract W-7405-eng-26. $0.50 (OTS).

The basic properties of nuclear reactors are discussed, and a detailed description of neutron behavior in the reactor is given. The complex mathematics of reactors is avoided; emphasis being placed on the underlying physical ideas. (D.E.B.)

8979 CF-54-7-136
Oak Ridge National Lab., Tenn.
OVERALL HEAT TRANSFER COEFFICIENT—URANYL SULFATE SOLUTION IN TUBE TYPE HEAT EXCHANGER. H. C. Savage and R. A. Lorenz. July 8, 1954. Decl. Feb. 20, 1956. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

An experimental investigation was made of the over-all heat transfer coefficient in heat exchanger tubes under simulated HRE operating conditions. A primary consideration was the effect of corrosion and/or film formation on the over-all coefficient after prolonged operation. An estimated value of the corrosion film coefficient is obtained from the data. (auth)

8980 CF-54-8-26
Oak Ridge National Lab., Tenn.
GRAVITY RETURN OF CONDENSATE FROM HRT STEAM DRUM TO MAIN HEAT EXCHANGER. R. C. Robertson. Aug. 2, 1954. Decl. Feb. 20, 1956. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Results of this study indicate that gravity return will not be possible above about 7.6-Mw core power and about 3.5-Mev blanket power. (W.L.H.)

8981 CF-54-9-143
Oak Ridge National Lab., Tenn.
FUEL LET-DOWN HEAT EXCHANGER. R. Van Winkle. Sept. 20, 1954. Decl. Dec. 15, 1955. 13p. Contract [W-7405-eng-26]. $0.20(OTS).

The design characteristics of the proposed HRT fuel letdown heat exchanger is described. (W.L.H.)

8982 CF-54-12-57
Oak Ridge National Lab., Tenn.
THREE DIMENSIONAL MULTI-GROUP REACTORS. L. C. Noderer. Dec. 7, 1954. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

It is suggested that economy of time in the solution of mulitgroup diffusion equations would be obtained by expanding fluxes and other expressions in the diffusion

equations in terms of a finite number of separable solutions of the Helmholtz equation which vanish on the extrapolated reactor boundary. The method is briefly developed. (B.J.H.)

8983 CF-54-12-100
Oak Ridge National Lab., Tenn.
A STUDY OF POSSIBLE BLAST EFFECTS FROM HRT PRESSURE VESSEL RUPTURE. Phillip M. Wood. Dec. 14, 1954. Decl. Dec. 19, 1955. 35p. Contract [W-7405-eng-26]. $0.30(OTS).

8984 CF-55-7-67
Oak Ridge National Lab., Tenn.
LARGE SCALE GAS SEPARATORS. J. A. Hafford. July 20, 1955. 33p. Contract [W-7405-eng-26]. $0.30(OTS).

In view of the anticipated progress of the homogeneous reactor program, a need for large scale gas separators is expected. Experiments with separators an order of magnitude larger than those heretofore tested are reported. Attempts are made to set up some criteria for design of any size separator needed. Several specific problems were investigated, such as void size, inlet disturbances, entrainment behavior and flow patterns. (auth)

8985 CF-55-8-95
Oak Ridge National Lab., Tenn.
AN EXAMINATION OF THE NEUTRON LOSSES IN THE TBR DUE TO THE USE OF PLATINUM AS A COATING FOR THE ZIRCONIUM CORE TANK. M. Tobias. Aug. 16, 1955. Decl. Feb. 9, 1956. 9p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Recent cross section measurements of the isotopes of Pt have led to the belief that it may be useful to re-examine this element with the aim of using it as a corrosion-resistant lining for reactor vessels. This work discusses the variation of the average cross section of Pt, assuming exposure to a constant flux of 10^{15} for periods ranging up to 20 years. The results show a decline in the average absorption cross section by a factor of 2 in about 3 years, followed by relatively slow decrease thereafter. Furthermore, the Pt will be steadily converted into Hg in significant amounts with the passage of time; the effect of this transformation upon the physical stability is not known, but it is probably deleterious. It may be concluded that exposure of a Pt liner does not improve its nuclear characteristics remarkably; significant losses in excess fuel production must be expected and justification for its use must rest primarily on its value from a corrosion standpoint. (auth)

8986 CF-55-10-17
Oak Ridge National Lab., Tenn.
HRT SPACE COOLER HEAT LOAD. F. C. Zapp. Oct. 5, 1955. 8p. Contract [W-7405-eng-26]. $0.15(OTS).

The total heat load within the HRT cell was found. Sources of loss through equipment and piping, cell walls and structures, blast and thermal shields, and pipe flanges were mathematically analyzed. (F.S.)

8987 CF-55-11-166
Oak Ridge National Lab., Tenn.
HRT THERMAL SHIELD SYSTEMS. C. L. Segaser. Nov. 9, 1955. 33p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

A closed cooling water circuit for the HRT thermal shield has been designed to maintain the temperature of the shielding constituents below 180°F, saturation temperature of water at 7.5 psia. Excessive loss of water will decrease the efficiency of the shield to attenuate fast neutrons. A closed cooling water circuit is necessary to prevent the leaching of B from the Colemanite ore which will be added to the shield constituents to reduce heat generation and secondary gammas. The cooling water circuit described includes a fill and vent system to maintain the desired water content of the shield as water is lost by evaporation and radiolytic decomposition, and a method of distributing and regulating the cooling water to the top, side, and bottom portions of the thermal shield. Although not relevant to the cooling system proper, a method of inhibiting the flow of convective air currents through the thermal shield is described. Specifications for the barytes aggregates for filling the side and bottom shields and the iron shot for the top shield are included. (auth)

8988 CF-55-12-97
Oak Ridge National Lab., Tenn.
EXTRAPOLATION DISTANCE ESTIMATES FOR REACTOR CALCULATIONS. M. Tobias. Dec. 9, 1955. 23p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

Calculated fictitious extrapolation distances which may be used to avoid treating the pressure vessel surrounding a homogeneous, heavy water moderated, spherical reactor as an additional region in survey-type calculations are presented. The extrapolation distances were calculated for one region, U^{235} fueled reactors containing U^{238}. Graphs of extrapolation distances in centimeters vs. pressure vessel thickness in inches have been prepared for a wide range of reactor parameters. Since the results are a measure of the reflection effect of the pressure vessel, the results could be used for two region spherical reactor calculations, or for cases where different fuel and fertile materials are considered, by finding the reactor on the curves which most closely resembles the one in question with respect to size, resonance escape probability, and thermal absorption cross section. It must be emphasized that these curves are intended principally for surveys where large numbers of reactors are to be considered from a general economic and nuclear standpoint. In considering such matters as thermal stress in the pressure vessel, use of these curves will probably lead to more accurate results than have been available in the past. Nevertheless, the values given are subject to all those defects of the diffusion approximation connected with closeness to boundaries and changes of nuclear properties on passing from one region to another. (auth)

8989 CP-478
[Chicago. Univ. Metallurgical Lab.]
TEMPERATURE COEFFICIENT OF THE REPRODUCTION FACTOR FOR DIFFERENT LATTICE ARRANGEMENTS. P. Morrison. Feb. 19, 1943. Decl. Feb. 15, 1956. 6p. (A-462). $1.80(ph OTS); $1.80(mf OTS).

The temperature coefficient is calculated for various lattice arrangements, taking into account the variation of $\eta = \nu/(\sigma_{cap}/\sigma_{fis}) + 1$ suggested by Fermi. Four contributions are included: leakage, levelling of the dip in thermal neutron density in the lump, resonance absorption, and hardening of the neutrons as they penetrate a metal lump. The departure of neutron temperature from lattice temperature decreases the total coefficient. Values are given for 3 typical piles; in general, the larger the U elements, the less stable the pile. A rod lattice tends to be more stable. A pile with metal lumps over 50 lbs. will be unstable. (auth)

8990 CP-1707
[Chicago. Univ.] Metallurgical Lab.
THERMAL STRESSES ARISING FROM DEFECTIVE STRIP IN BOND. G. Young. May 18, 1944. Decl. Feb. 14, 1956. 5p. (A-2435). $1.80(ph OTS); $1.80(mf OTS).

Stresses set up by an insulating strip in the bond are estimated and found to be small compared to those normally present without the defect. (auth)

8991 CP-2024
[Clinton Labs., Oak Ridge, Tenn.]
PRODUCT ENERGY EXPERIMENT. Final Report on Problem Assignment No. 102-X20P. L. B. Borst. Feb. 15, 1945. Decl. Feb. 15, 1956. 95p. Contract W-7405-eng-39. $15.30(ph OTS); $5.40(mf OTS).

A representative sample of U within the Clinton pile was replaced by new U after which the pile was operated for a period of 10 days under carefully controlled conditions. The power was determined by the temperature rise of the cooling air and the total energy of the run was determined to be 200,800 ± 240 KWH. During the run a careful record was kept of pile performance to determine changes in reactivity due to long period pile poisoning. No effect was found definitely attributable to that source. This sample of metal was discharged and allowed to cool for two weeks. The radiation level of slugs in known portions was determined and a neutron distribution was plotted for the metal lattice. The maximum intensity was found to be 2.5 times the average. The intensity factors for various portions were checked against those in previous use. The experimentally determined quantities checked the earlier calculations satisfactorily. Two batches of the metal sample of one-third ton each, were made up from slugs taken to be representative of the total metal within the pile. These samples were dissolved in the separation plant. Portions of the batches at various stages of dissolving were submitted for analysis. Product analyses showed 0.91 ± 0.03 gm Pu produced per Mwd energy output. A comparison of radiation measurements on the slugs with the results of Ba analysis demonstrated adsorption of Ba during dissolving. The capture/fission ratio was determined for central metal to be 0.88 ± 0.05. The energy per fission was determined to be 209 ± 15 Mev. (auth)

8992 CP-2453
Chicago. Univ. Metallurgical Lab.
NEUTRON DISTRIBUTION AROUND A BLACK SPHERE WITH A GAP. G. N. Plass. Dec. 5, 1944. Decl. Feb. 15, 1956. 22p. Contract W-7401-eng-37. $4.80(ph OTS); $2.70(mf OTS).

Successive approximations are obtained from transport theory for the neutron distribution around a black sphere surrounded by a spherical gap and a non-absorbing medium extending to infinity. Six cases are calculated numerically to show the difference between this treatment and simple diffusion theory. The extrapolation distance and a quantity that is essentially the thermal utilization are calculated in different approximations. It is found that the neutron density in the gap, instead of being a constant as predicted by the simple theory, may vary by a factor of one-third in cases of practical interest. (auth)

8993 CP-2655
[Chicago. Univ. Metallurgical Lab.]
THE DIGGING-IN OF A WARPED ROD INTO A RIB. A. V. Martin. Jan. 22, 1945. Decl. Feb. 13, 1956. 11p. Contract W-7401-eng-37. $3.30(ph OTS); $2.40 (mf OTS).

Some rather idealized considerations are given regarding the depth a warped rod presses into the ribs at the places of contact. It appears that this distance may, under some conditions, be of the order of 70 times greater than for a straight rod resting uniformly on the ribs. (auth)

8994 CP-3722
[Clinton Labs., Oak Ridge, Tenn.]
THE PILE OSCILLATOR FOR CAPTURE CROSS SECTION MEASUREMENTS. Problem Assignment No. PX6–1. C. D. Moak, L. A. Pardue, John Strong, and E. O. Wollan. June 30, 1945. Decl. Feb. 15, 1956. 16p. Contract W-7405-eng-39. $3.30(ph OTS); $2.40 (mf OTS).

A reactor oscillator for measuring absorption cross sections by measuring reactor reactivity is described and the techniques used are analyzed. The sensitivity of the apparatus is sufficient to readily detect a total sample cross section of about 10^{-3} cm^2. (F.S.)

8995 CT-1480
[Chicago. Univ.] Metallurgical Lab.
EVALUATION OF THE ZYGLO INSPECTION METHOD AS APPLIED TO CORES AND CANS. Guy M. Inman. Mar. 15, 1944. Decl. Feb. 14, 1956. 18p. (A-2066) $3.30(ph OTS); $2.40(mf OTS).

Zyglo Inspection will reveal pits and cracks from 0.6 to 10 mils in diameter or width and from 3 mils to any depth. If a crack is relatively shallow and wide the oil will be washed out and no indication obtained. Defects which are large enough to be easily seen by the unaided eye are seldom indicated by Zyglo. By Zyglo does reveal very small and narrow cracks and pits much better than they can be seen by the unaided eye. (auth)

8996 CT-3765
Argonne National Lab., Lemont, Ill.
DIFFUSION OF FISSION PRODUCTS FROM BERYLLIA FUEL ROD MATERIAL. J. E. Wilson. Jan. 17, 1947. Decl. Feb. 15, 1956. 10p. Contract W-31-109-eng-38. $3.30(ph OTS); $2.40(mf OTS).

Xenon diffusing from a Be fuel rod was measured as a function of temperature and density. There is more rapid diffusion at higher temperatures and diffusion decreases with density. (F.S.)

8997 HW-25649
[Hanford Works, Richland, Wash.]
AUTOCLAVING OF ANODIZED SLUG JACKETS. R. S. Dalrymple. Sept. 16, 1952. Decl. Feb. 20, 1956. 4p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80(mf OTS).

Autoclaving completely removed anodic film. Therefore, anodizing prior to autoclaving must be abandoned, and methods must be found for removing the autoclave film in order that the anodic film can be applied. (D.E.B.)

8998 HW-26527
Hanford Works, Richland, Wash.
USE OF THE WATER BOILER NEUTRON SOURCE FOR EXPONENTIAL EXPERIMENTS. D. E. Davenport. Dec. 11, 1952. Decl. Feb. 20, 1956. 7p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

The advantages and disadvantages of the application of the Water Boiler Neutron Source to exponential experiments are briefly considered. The advantages of the water boiler include the short time required to put it into operation, its safety, its available flux, and probably its cost. The disadvantages include the amount of materials required and space requirements. (B.J.H.)

8999 HW-30390 and HW-30390AD
Hanford Atomic Products Operation, Richland, Wash.
ESTIMATED POWER GENERATION IN MTR SLUG TEST FACILITY. H[erschel] Neumann. Dec. 30, 1953. Decl. Feb. 8, 1956. 5p. (HW-30390). Addendum. Sept. 20, 1954. Decl. Feb. 6, 1956. 3p. (HW-30390AD). Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

These two reports were issued separately but are cataloged as a unit.

Simple flux and power calculations for the MTR Slug Test Facility indicate that the power generation per foot of Hanford slugs will be about $4.9 \times 10^{-10}\ \phi_0$ watts, where ϕ_0 is the neutron flux at the test position, before insertion of the slugs, in neutrons/cm^2/sec. For example, to obtain a power generation of about 70 kilowatts/foot, $\phi_0 = 1.4 \times 10^{14}$ neutrons/cm^2/sec. The facility should be so placed that the

water hole corner is closest to the MTR core, to minimize flux gradients across the test slugs. (auth)

9000 HW-32333
Hanford Atomic Products Operation, Richland, Wash.
FLUX RISE IN A½" URANIUM ROD LOADED INTO A B, D, F-TYPE LATTICE. R. C. Lloyd. July 6, 1954. Decl. Feb. 20, 1956. 4p. Contract [W-31-109-Eng-52]. $1.80 (ph OTS); $1.80(mf OTS).

Experiments were made to find the average exposure of a single ½-in. rod of U loaded into the 105 Pile as compared with that of the U in the surrounding standard Hanford tubes. It was concluded that the average fissions per unit volume is about twice as great for the ½-in. U rod as for the adjacent standard slugs. (B.J.H.)

9001 HW-34187
Hanford Atomic Products Operation, Richland, Wash.
A CHART OF NEUTRON BLACKNESS FOR SOLID CYLINDRICAL RODS. G. W. Stuart. Dec. 20, 1954. Decl. Jan. 7, 1956. 8p. Contract W-31-109-eng-52. $0.10(OTS).

A plot is presented of the probability that a neutron incident upon an infinite, solid cylindrical rod will be absorbed by that rod versus the optical thickness of the rod for various ratios of scattering to total rod cross sections. (auth)

9002 KAPL-M-CDM-2
Knolls Atomic Power Lab., Schenectady, N. Y.
THREE GROUP METHOD FOR CALCULATION OF HIGH CRITICAL MASS THERMAL REACTORS. C. D. McKereghan. Aug. 25, 1953. Decl. Feb. 9, 1956. 8p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80(mf OTS).

A three-group theory for the calculation of thermal reactors was developed and adapted for machine calculation. It was used for investigating the SAR. (F.S.)

9003 KAPL-M-HH-2
[Knolls Atomic Power Lab., Schenectady, N. Y.].
A TWO GROUP CALCULATION FOR REACTIVITY TRENDS IN THE CRITICAL EXPERIMENT. Henry Hurwitz, Jr. Aug. 11, 1947. Decl. Feb. 7, 1956. 6p. Contract W-31-109-eng-52. $1.80(ph OTS).

The reactivity trends for a critical assembly made up of a Be sphere with a central core of U^{235} and Be are plotted. (D.E.B.)

9004 KAPL-M-LGB-2
Knolls Atomic Power Lab., Schenectady, N. Y.
METHOD OF CALCULATION OF FAST TEMPERATURE COEFFICIENTS FOR NUCLEAR REACTORS. L. G. Barrett. Dec. 22, 1954. 31p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

9005 KAPL-M-LML-1
[Knolls Atomic Power Lab., Schenectady, N. Y.]
CONTROL MOCKUP. J. H. Pigott and L. M. Loeb. July 15, 1949. Decl. Feb. 9, 1956. 39p. Contract [W-31-109-Eng-52]. $12.30(ph OTS); $4.50(mf OTS).

The control mockup is for the purpose of testing safety and control mechanisms for the Submarine Intermediate Reactor and the KAPL Intermediate Power Breeder Reactor under simulated pile conditions. In the control mockup, all the pile conditions with the exception of radioactive material are duplicated. The design drawings are given, and test results are reported. (D.E.B.)

9006 KAPL-M-PLH-1
[Knolls Atomic Power Lab., Schenectady, N. Y.]
SELF-SHIELDING FACTORS FOR HETEROGENEOUS GEOMETRIES AT LOW ENERGIES. P. L. Hofmann. Dec. 12, 1951. Decl. Feb. 8. 1956. 10p. Contract W-31-109-eng-52. $1.80(ph OTS); $1.80(mf OTS).

Work on self-shielding coefficients to be used in reactor multigroup calculations for heterogeneous geometries at low energies is summarized. (F.S.)

9007 KAPL-M-SKH-1
Knolls Atomic Power Lab., Schenectady, N. Y.
THE METHOD OF ANALYZING STEADY-STATE AND TRANSIENT TEMPERATURE DISTRIBUTIONS IN THE THERMAL SHIELD. S. K. Hellman. Oct. 5, 1953. 28p. Contract W-31-109-eng-52. $4.80(ph OTS); $2.70 (mf OTS).

A method for evaluating the temperatures involved in a liquid-metal cooling system with high thermal stresses is reported. Equations are set up in finite difference form to be handled on a digital computer and they can be solved for a steady state or transient condition of flow rate and heat generation. (F.S.)

9008 KAPL-M-VW-1
Knolls Atomic Power Lab., Schenectady, N. Y.
PRELIMINARY PLANS FOR A URANIUM CHAIN REACTOR FOR EXPERIMENTAL USE. [nd]. Decl. Feb. 9, 1956. 21p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

A power reactor designed to give construction experience and as an experimental neutron source is described. It is to be built of U^{235} with low carbon steel jacketing and structural material and will be NaK cooled. (F.S.)

9009 M-4413
Ferguson (H. K.) Co., New York.
BROOKHAVEN NATIONAL LABORATORY DESIGN MANUAL. BOOK 1, VOL. 4. PILE AUXILIARIES. Apr. 1949. Decl. Jan. 13, 1956. 134p. For Brookhaven National Lab. Contract [AT-30-2-gen-16]. (HKF-9). $21.30(ph OTS); $6.90(mf OTS).

This volume, No. 4 of the Pile Design Manual, consists of three chapters describing three units in the Pile Complex: the Fan House, Cooling Tower, and Stack. The location of these units is shown, and the functional relation is described. (auth)

9010 N-2236
Chicago. Univ. Metallurgical Lab.
CONSIDERATIONS RELATIVE TO THE GAS FLOW CHANNELS AND HEAT TRANSFER SURFACES OF HIGH-TEMPERATURE OXIDE PILE. A. Robertson. Mar. 1, 1946. Decl. Jan. 30, 1956. 26p. $4.80(ph OTS); $2.70 (mf OTS).

Calculations are presented which confirm the feasibility of a He-cooled power reactor. Helium flow, friction losses, and pressure drop in the cooling system are shown. (D.E.B.)

RADIATION EFFECTS

9011 AECD-3871
Knolls Atomic Power Lab., Schenectady, N. Y.
ANNEALING OF RADIATION DAMAGE IN BORON CARBIDE. Charles W. Tucker, Jr. and Peter Senio. Aug. 1952. Decl. Dec. 8, 1955. 13p. Contract [W-31-109-Eng-52]. (MEMO-CWT-3). $0.20(OTS).

The lattice expansion of irradiated B_4C is removed in the 100°C temperature interval between 600 and 700°C. Since only 3% of the estimated He present in the B_4C is removed by a 19 hr anneal at 800°C, it can be inferred that the relaxation of the lattice expansion must be due to the motion of irradiation produced interstitial B and C atoms to vacant lattice sites or to the edge of the lattice. Since only 3% of the He is removed from the lattice in 19 hr at 800°C, it can be concluded that at still lower temperatures considerably less He will escape. (auth)

9012 AECD-3939
Knolls Atomic Power Lab., Schenectady, N. Y.
RADIATION DAMAGE IN BORON CARBIDE. C. W. Tucker, Jr. and P. Senio. Aug. 18, 1953. Decl. Feb. 20, 1956. 5p. Contract W-31-109-eng-52. (MEMO-CWT-6). $1.80(ph OTS); $1.80(mf OTS).

Single crystal and polycrystalline specimens of boron carbide were irradiated in an integrated thermal neutron flux of 3×10^2 neutrons/cm^2 in the MTR. The resulting dimensional changes are discussed. X-ray-diffraction patterns of the irradiated single crystals show a striking increase in the intensity of the thermal diffuse scattering by the lattice due to the irradiations. (B.J.H.)

9013 AECD-4218
Knolls Atomic Power Lab., Schenectady, N. Y.
TRANSCRIPT SUMMARY OF VARIOUS IRRADIATION DAMAGE REPORTS ON ELECTRICAL AND THERMAL INSULATING MATERIAL. George R. Sherrard. [1954?]. Decl. Feb. 8, 1956. 10p. Contract W-31-109-Eng-52. (MEMO-GHS-1). $1.80(ph OTS); $1.80(mf OTS).

9014 AECD-4232
Massachusetts Inst. of Tech., Oak Ridge, Tenn. Engineering Practice School.
ANALYSES OF DECAY CURVES OF IRRADIATED PLASTICS. R. N. Saleeby, Jr., J. R. Cheshire, and W. P. Jensen. June 22, 1949. Decl. Feb. 9, 1956. 20p. For Carbide and Carbon Chemicals Corp., K-25 Plant. Contract [W-7405-eng-26, Subcontract 70]. (KT-39). $3.30 (ph OTS); $2.40(mf OTS).

Decay curves for various plastics, together with their graphical analyses, are shown. The radioactive isotopes probably present in the irradiated plastic, and the stable parent isotopes from which they were formed, are listed. Also presented are the approximate weight percentages of the parent element in the plastic, where data necessary for this calculation were available. (auth)

9015 CF-54-8-226
Oak Ridge National Lab., Tenn.
IRRADIATION TEST OF STATIC BUNA-N O-RING SEALS. J. M. Trummel. Aug. 25, 1954. Decl. Feb. 20, 1956. 13p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40 (mf OTS).

The object of this experiment was to determine the life expectancy of four groups of Buna-N O-ring oil seals under gamma irradiation. These static seals were used to seal Gulfspin 60 oil at 75 psi pressure differential at about 125°F in a test arrangement placed in the flux of the Low Intensity Testing Reactor. Gamma radiation at test location was estimated as 4×10^6 r/hour. Observed radiation times to first observed seal leakage varied from 128 hours to 259 hours. Corresponding doses to first leakage varied from 5×10^8 rep to 1×10^9 rep. Examination of rings after test revealed hardening of O-rings. No appreciable recovery of shape occurred when O-rings were removed from container. Surfaces of rings were smooth except for one ring which was damaged during assembly. (auth)

9016 CF-55-9-163
Oak Ridge National Lab., Tenn.
RADIATION DAMAGE TO FREON. Carlyle Michelson. Sept. 30, 1955. 7p. Contract [W-7405-eng-26]. $1.80 (ph OTS); $1.80(mf OTS).

This study predicts the decomposition of Freon-11 by γ radiation, resulting in the formation of ions which are incompatible with stainless steel. The possibility of a corrosion problem in the HRT cold traps and refrigeration system, and also the possibility of gas binding and heavy oil formation must therefore be considered. An experimental investigation of the effects of γ radiation on Freon and an evaluation of the resulting problems are recommended. (auth)

9017 HW-38327
Hanford Atomic Products Operation, Richland, Wash.
ANALYSIS OF BROADENED X-RAY DIFFRACTION PEAKS. K. R. Merckx. July 27, 1955. 24p. Contract [W-31-109-eng-52]. $4.80(ph OTS); $2.70(mf OTS).

The mathematical methods employed in the analysis of x-ray diffraction patterns for the determination of cold work and radiation damage are developed. (D.E.B.)

9018 KAPL-M-WOH-2
Knolls Atomic Power Lab., Schenectady, N. Y.
MEASUREMENT OF PLUTONIUM DECONTAMINATION. Walter O. Haas. Nov. 17, 1950. Decl. Feb. 8, 1956. 5p. Contract W-31-109-eng-52. $1.80(ph OTS).

Under normal counting conditions, the Pu^{241} 0.01–0.2 Mev beta and Pu^{239} soft electrons will be absorbed by the minimum amount of absorber used to prevent α counting. The β, γ activity of Pu^{239} consists chiefly of low-energy x rays. The Al absorption curve corresponds to that of 1.5-Mev β's but weak x rays are absorbed by heavier metals. Application of this property of low-energy x rays would appear to be of use in the definition of Pu dF and in the setting of specifications. (F.S.)

9019 MIT-1066
Massachusetts Inst. of Tech., Cambridge. Metallurgical Project.
RADIATION DAMAGE (INTERNAL FRICTION) IN 99.99+% ALUMINUM. W. B. Nowak. Apr. 30, 1951. Decl. Feb. 16, 1956. 16p. Contract AT(30-1)-981. $3.30(ph OTS); $2.40(mf OTS).

Preliminary measurements have been made of the internal friction of 99.99% Al at 40 kc as a function of temperature from 300 to 65°K. The specimens were annealed at 640°C for 1 hr, from a half-hard condition, and had a resultant average grain diameter of 1.6 mm. Irradiations of 2×10^{17} and 4×10^{14} nvt (fast) were obtained in the Brookhaven pile. Aging as well as irradiation effects are reported. (auth)

SHIELDING

9020 AECD-3982
Oak Ridge National Lab., Tenn.
THE EFFECT OF IRON BEHIND BERYLLIUM IN THE ORNL LID TANK (EXPT. 38). G. T. Chapman and J. D. Flynn. June 30, 1953. Decl. with deletions Nov. 30, 1955. 13p. Contract [W-7405-eng-26]. $0.15(OTS).

The configurations for the experiment consisted of a 28.5-cm Be slab followed by various thicknesses of Fe. The Be slab (average density 1.23 g/cc) was made of pellets in a steel container (0.32-cm walls), and the Fe was in the form of 2.22 cm thick slabs. Because the Fe slabs were warped some water was distributed in each configuration. In order to determine the effect of this water, measurements made on 15 Fe slabs in water were compared with measurements where the slabs were in a steel dry tank (0.3-cm walls). The thermal neutron flux fast neutron dose and gamma dose were measured behind each configuration, and the data are presented. The detectors used for the measurements were: 3-in. fission chamber and 12½-in. BF_3 counter for thermal neutrons; fast neutron dosimeter for fast neutrons; and anthracene scintillation counter for γ rays. (auth)

9021 AECD-4221
Knolls Atomic Power Lab., Schenectady, N. Y.
A PROBLEM IN THE CONVERSION OF NEUTRON DOSE TO FLUX. D. E. McMillan. June 29, 1953. Decl. Feb.

20, 1956. 25p. Contract W-31-109-Eng-52. (MEMO-DEM-1). $4.80(ph OTS); $2.70(mf OTS).

A calculation is made of the flux entering the ORNL Lid Tank and the water at the north face of the ORNL Bulk Shielding Reactor. The values found by converting dosimeter measurements to flux are 3.51×10^6 n/cm^2 sec and 9.01×10^5 n/cm^2 sec/watt respectively as compared with 35.4×10^6 n/cm^2/sec and 84.1×10^5 n/cm^2 sec/watt calculated from power leakage considerations. The uncertainties in the calculations are such that the apparent differences may be in error by a factor of 2 or 3. (auth)

9022 CF-50-3-43
[Oak Ridge National Lab., Tenn.]
DETERMINATION OF TEMPERATURE PATTERNS IN EAST SIDE THERMAL SHIELD OF THE MATERIALS TESTING REACTOR. V. A. Zora. Mar. 10, 1950. 11p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Calculations indicating that the proposed cooling air flow rate of 25,400 cfm leads to specified maximum and minimum plate temperatures in the subject shield; complete results of this analysis have been plotted as temperature above ambient air as a function of distance from the reactor east-west centerline. (F.S.)

9023 HW-22845
[Hanford Works, Richland, Wash.]
FIELD HANDLING STUDY OF HEAVY AGGREGATE CONCRETE. Pile Technology Final Report—Test No. 34. C. D. Emmons. Dec. 7, 1951. Decl. Feb. 20, 1956. 10p. Contract [W-31-109-Eng-52]. $1.80(ph OTS); $1.80 (mf OTS).

A number of small-batch pours of heavy aggregate concrete were made to establish procedures for constructing a high density concrete shield. Efforts were made to simulate typical field situations which would be encountered in actual construction. (F.S.)

URANIUM AND URANIUM COMPOUNDS

9024 AECD-3798
Argonne National Lab., Lemont, Ill.
PREPARATION OF ALPHA URANIUM SINGLE CRYSTALS. PART I. PHASE TRANSFORMATION METHOD. Final Report—Metallurgy Program 2.1.4. E. S. Fisher. Nov. 18, 1953. Decl. with deletions Dec. 3, 1955. 40p. Contract W-31-109-eng-38. $0.30(OTS).

The solid state phase transformations which occur when cooling U from the melting point to room temperature precludes the utilization of the various methods for preparing single crystals by controlled cooling from the liquid state. Any single crystal of gamma phase U which could be formed would be susceptible to recrystallization in cooling through the transformation temperatures of gamma to beta and beta to alpha at approximately 770 and 660°C, respectively. An attempt has been made to utilize a modification of the controlled cooling methods in which solid specimens were heated to and slowly cooled from the beta phase. The method investigated was a modification of the Bridgman technique for growing single crystals from a melt. Specimens which were pointed at one end were gradually moved through a gradient of decreasing temperature from temperatures at which the beta phase is stable in order to encourage a single nucleus of alpha phase to form at the extreme point and serve as a seed for growth of a single alpha crystal from the transforming aggregate of beta grains. An investigation was made to determine the feasibility of preparing U single crystals similar in structural perfection to those prepared by the grain coarsening procedure. In this respect, the investigation has not been completed. Although it was found feasible to prepare single crystals of relatively large dimensions, the structural perfection of the single crystals was far from desirable for most purposes. Besides the conditions which are inherited in adopting the Bridgman method, such as material composition, rate of specimen travel, and degree of temperature gradient, the size, shape, and penultimate structure of the specimens were also varied. With the apparatus used, the degree of structural perfection could not be significantly changed. The bulk of this investigation was concerned with determining the conditions under which the imperfect single crystals could be made so large as to fill the cross section of the rod. Among the 18 experimental specimens, only one specimen of high purity material was included. The results with this specimen indicated that material composition is a large factor. As the effects of most of the other variables were investigated using lower purity material, the conclusions indicated by the results may not be completely valid when considering high purity material. In the following report a general description of the structures produced by this treatment is presented. This is followed by a summary of the indicated effects of the variables on the structures. A small amount of information obtained by x-ray diffraction is presented. (auth)

9025 KAPL-M-APB-1(Del.)
Knolls Atomic Power Lab., Schenectady, N. Y.
THERMODYNAMIC CALCULATIONS ON REACTIONS OF UO_2 WITH GRAPHITE AND SILICON CARBIDE. A. P. Beard. Oct. 9, 1950. Decl. with deletions Feb. 6, 1956. 5p. Contract W-31-109-Eng-52. $1.80(ph OTS); $1.80 (mf OTS).

Thermodynamic calculations on UO_2 reactions with graphite and SiC are summarized. It was concluded that neither graphite nor SiC reduce UO_2 to metallic U, that graphite reacts with UO_2 to give UC_2 and CO at high temperatures, and that SiC does not react with UO_2 in any of the reactions studied. (B.J.H.)

9026 LAMS-1358
Los Alamos Scientific Lab., N. Mex.
LOW TEMPERATURE DILATOMETRY OF URANIUM. Henry L. Laquer and Adam F. Schuch. Jan. 15, 1952. Decl. Apr. 5, 1956. 13p. Contract W-7405-eng-36. $0.15(OTS).

Preliminary studies on three cast U specimens indicate that their lengths decrease by $(2.9 \pm 2) \times 10^{-3}$ on going from 300 to 75°K. On further cooling there is a further decrease of about 0.2×10^{-4} to 50°K, followed by an increase in length of about 0.4×10^{-4} when the temperature is lowered to 20°K. The net effect is that U has a greater density in liquid N than it has in liquid H. There is no permanent length change even after 4 cycles to liquid H temperatures. (auth)